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# Dear Reader,

## Do you do force finishing in cosmetic dentistry?

I have been practising clinical dentistry for almost 20 years. Now my major clinical workload is shifting towards the management of complex smile defects due to occlusal disharmony. These cases are always difficult to manage because destructive force components are not visible.

In the performance of cosmetic dentistry, the force components are frequently neglected or misunderstood. Therefore, the physical strength of tooth-coloured restorative materials is still an important topic in cosmetic dentistry. The clinician hopes that the selected restorative materials will overcome potential fracture of the restorations and hence generally selects materials that are much stronger than natural teeth. However, it is necessary to understand that the highly concentrated bite-force locations within the occlusal scheme may not always fracture the restorations, but will create other problems with the teeth, muscles and/or joints in some patients. Therefore, if the clinician overcomes potential fracture through material choice, he or she may actually be ignoring the underlying force factors.


It is interesting to note that, globally, we cosmetic dentists spend more of our clinical time and effort on aesthetic outcome. This is because aesthetic components are always visible to both the clinician and patient, and the outcome can be immediately appreciated. However, the force components are invisible, and their negative effects are not easily appreciated clinically until they become chronic. Another reason that occlusal force can be overlooked is that special tools and clinical techniques are required to demonstrate and measure the force factors clinically. Therefore, force is the most neglected component in cosmetic dentistry.

Last year, I proposed the integration of the concept of force finishing into the conventional case-finishing protocol of dentistry. I am pleased to mention here that the concept has been widely accepted in dentistry. I think it is because the word "finishing" is greatly relevant in dentistry. The concept of force finishing is based on the universal principles of force balance and load timing during dynamic occlusion. Optimally, after proper force finishing, all teeth should come into contact with one another at about the same time and with harmonised occlusal forces and measurably short disclusion timing. When this does not occur, the clinical case is considered to be unbalanced and poorly force finished.

In cosmetic dentistry, forces are finished using articulating paper marks, but scientifically speaking such marks can tell the clinician only about the location of tooth contact and the contact area. In order to achieve quality force finishing, the clinician needs to use the proper tools and technology. The fundamental tool for force finishing is a digital force scanner (T-Scan III, Tekscan) that can measure clinical bite-force data precisely and objectively, while displaying the findings for clinical interpretation and treatment. Such clinical data helps the clinician to achieve tooth-contact forces and timing sequences that are preservational, rather than destructive, regarding the final case result.

It is to be noted that whatever the theory or concept of occlusal scheme selected during the treatment procedure, the role of force finishing is paramount to achieving long-term optimum results in terms of health, function, aesthetics and high patient satisfaction with minimal biological cost.

Yours faithfully,



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Dr Sushil Koirala  
Editor-in-Chief



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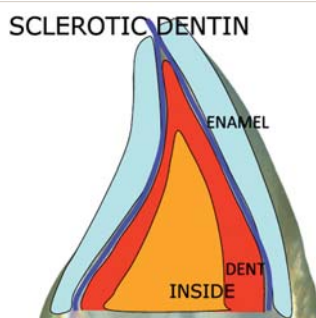
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# MiCD customised case-finishing concept and clinical protocol

Author\_Dr Sushil Koirala, Nepal

**The sooner the better:** Follow early diagnosis and intervention approach.

**Smile Design Wheel approach:** Understand psychology, establish health, restore function and enhance aesthetics (PHFA sequences of the Smile Design Wheel—Fig. 2).

**Do no harm:** Minimise the possible biological cost.

**Evidence-based selection:** Select materials, tools, techniques and protocols based on scientific evidence.

**Keep in touch:** Encourage regular follow-up and maintenance.

Fig. 1

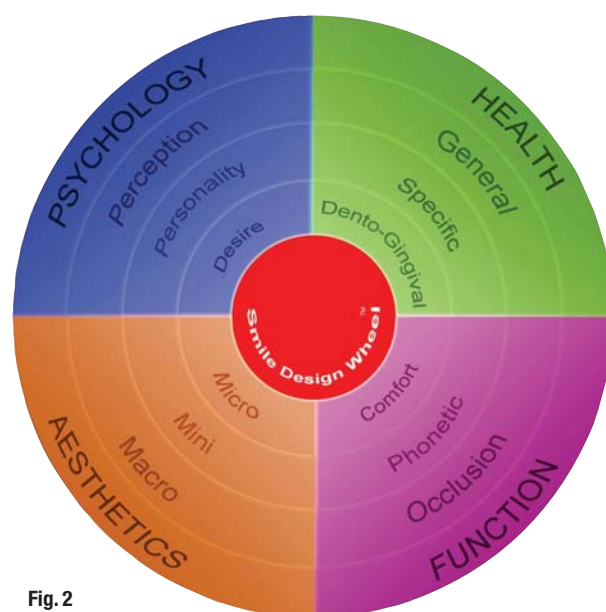


Fig. 2

Fig. 1\_MiCD core principles.<sup>1</sup>

## \_Abstract

Fig. 2\_Smile Design Wheel.

Case finishing is one of the important clinical steps in dentistry. Aesthetics, functional forces and oral health are the three fundamental components that need to be considered during case finishing. Aesthetic components are clinically visible and guided by the subjective analysis (perception) of the patient and the clinician. However, the force components are invisible,

and their adverse effects are not easily appreciated clinically until the effects become chronic. Moreover, the force components require special tools and clinical techniques to demonstrate

- I. Molar relationship: The distal surface of the distobuccal cusp of the maxillary first molar occludes with the mesial surface of the mesiobuccal cusp of the mandibular second molar.
- II. Crown angulation (mesiodistal tip): The gingival portion of each crown is distal to the incisal portion and varies with each tooth type.
- III. Crown inclination (labiolingual, buccolingual):
  - \_Anterior teeth (incisors) are at a sufficient angulation to prevent overeruption.
  - \_Maxillary posterior teeth: The lingual tip is constant and similar from the canine to second premolar and increased in the molars.
  - \_Mandibular posterior teeth: The lingual tip increases progressively from the canines to the molar.
- IV. No rotations.
- V. No spaces.
- VI. Flat occlusal planes.

Fig. 3

Fig. 3\_Andrews' six keys to occlusion.<sup>2</sup>

and measure them clinically. Therefore, the force is the most neglected component in cosmetic dentistry during case finishing.

When the force components are not addressed properly during the treatment, clinicians may encounter various clinical problems, such as damaged restorations (veneers, onlays, crowns and bridges); fractured teeth; tooth mobility; abnormal tooth wear and sensitivity; pain in the teeth, muscles and jaw joints; and increased neck pain, ear pain and headache.

In cosmetic dentistry, forces are finished based on articulating paper mark interpretation and the patient's proprioception feedback. It has been documented in the literature that articulating paper is a poor indicator of occlusal disharmony and cannot measure occlusal load and the timing of tooth contacts. The proper tools and techniques can measure precisely and objectively the necessary occlusal parameters required for finishing the force components in cosmetic dentistry.

Minimally invasive cosmetic dentistry customised case finishing integrates the concept of force finishing into the conventional case-finishing protocol of dentistry, in the hope that it will help practitioners to achieve long-term optimum results in terms of health, function and aesthetics, and high patient satisfaction with minimal biological cost.

## \_Introduction

The treatment modalities and protocol of health care should be aimed at the establishment of health and the preservation of the human body with its natural function and aesthetics. The comprehensive concept of minimally invasive cosmetic dentistry (MiCD) and its treatment protocol were introduced in 2009 with the basic aim of a clinician effecting optimum clinical therapeutic improvements in smile enhancement, while performing corrective procedures that require as little clinical intervention as possible.<sup>1</sup>

The intervention level of the treatment in MiCD depends on the type of smile defects and the aesthetic needs of the patient.<sup>1</sup> The five core principles (Fig. 1) of the MiCD concept help to guide the clinician in achieving the desired smile enhancement with minimal clinical intervention. However, the core principles must be adapted from case selection to the final case-finishing stages. Proper case finishing is not possible without understanding its two com-

**1. Centric relation theory (Schuyler):**<sup>8</sup> The occlusion is determined by the manner in which the ligaments brace the components of the jaw joint, particularly the rearmost hinge axis. There are various clinical techniques proposed to record centric relation (CR). The bimanual manipulation technique of Dawson,<sup>9</sup> the Lucia jig and the leaf-gauge technique, as reported by Long,<sup>10</sup> are popular techniques for positioning the mandible in CR. Prior to this, chin-point guidance and swallowing techniques were used to locate and record CR.

**2. Neuromuscular theory (Jankelson):**<sup>11</sup> The occlusion is determined by gravity and based on the position in which the jaw muscles are most relaxed. Trans Electric Nerve Stimulation (TENS) is employed to relax the muscles.

**3. Intercuspal theory:** The occlusion is determined by the habitual fit with the most tooth contact.

**4. Anterior protrusive position theory (Gelb 4/7 position):**<sup>12</sup> The occlusion is determined by the manner in which the muscles brace the components of the jaw joint. The Gelb 4/7 jaw position is found by using appliances to open the occlusion and reposition the mandible forwards and downwards of the true centre of the glenoid fossa.

Fig. 4

ponents, namely the micro-aesthetics and the occlusal forces.

It is, however, the force component that is often neglected, or improperly considered, in cosmetic dentistry. This article describes an MiCD customised case-finishing (MCCF) concept and protocol that respect both force and aesthetic components.

## \_MiCD customised case-finishing concept

Case finishing is one of the most important steps in any clinical treatment in dentistry. It has three major components that need to be considered: aesthetics, overall health and occlusal function. It is interesting to note that case finishing is viewed differently in different disciplines of dental medicine. In orthodontics,

Fig. 5\_Mechanism of occlusion-force alteration.<sup>15</sup>

Clinicians can affect the occlusal forces by altering the following five areas during occlusal scheme preparation:<sup>15</sup>

**1. Intercuspal position (ICP) contacts:** Restorative dentists can control which teeth come into contact and the number of tooth contacts during closure in the ICP.

**2. Excursive contacts:** By altering the number and type of tooth contacts in eccentric excursions, restorative dentists have the ability to change muscular contraction and the distribution of forces.

**3. Angle of tooth contacts:** It is well known that the depth of the overbite or steepness of the angle of guidance of the teeth will have an impact on the manner in which forces are distributed.<sup>37,38</sup> The angle of impact will affect not only the distribution of the force but also the ability of the muscle to contract.

**4. Condylar position:** The condylar position chosen will have a dramatic impact on the ability to control which teeth contact each other and when they contact.

**5. Vertical dimension of occlusion:** The vertical dimension of occlusion can be opened or closed when restoring at least one arch. Decreased vertical dimension increases the occlusal forces.

Fig. 5

case finishing fundamentally focuses on six keys to occlusion (Fig. 3) described by Andrews,<sup>2</sup> whereas in cosmetic dentistry, it is considered the last step of the clinical procedure and entails

**Fig. 6** Force-finishing clinical facts.

1. Unilateral tooth contacts increase force in the opposite joint.
2. Bilateral even tooth contacts during ICP give more stability to the teeth, muscles and joints.
3. When the number of occluding teeth increases, the total percentage of forces to each tooth decreases.
4. The vertical forces created by tooth contacts are well accepted by the periodontal ligament, but horizontal forces cannot be effectively dissipated.<sup>39</sup> These forces may create pathological bone responses or elicit neuromuscular reflex activity in an attempt to avoid or guard against the incline plane contacts.<sup>40</sup> Hence, directing the occlusal force through the long axis of the tooth (axial loading) should be a goal of force finishing in the posterior teeth. Axial loading can be accomplished by cusp tip to flat surface contacts or by creating reciprocal incline contacts (also known as tripodisation).
5. The amount of the force that can be generated between teeth depends on the distance of the teeth from the temporomandibular joint, combined with applied muscular force vectors (fulcrum principle). Greater force can be applied to the posterior teeth than to the anterior teeth.<sup>41–43</sup> The posterior teeth function effectively when accepting the axial forces (axial loading) applied during closure of the mouth. They accept these forces well, primarily owing to their position in the arches because the force can be directed through the long axes and thus dissipated effectively.<sup>16</sup>
6. The anterior teeth are not positioned well in the arches to accept heavy axial force. They are normally positioned at a labial angle to the direction of closure, so loading them axially is nearly impossible.<sup>44</sup>
7. The anterior teeth, unlike the posterior teeth, are in proper position to accept horizontal forces of eccentric mandibular movements.<sup>43,45,46</sup>
8. The anterior teeth should immediately disclude the posterior teeth during excursive movements,<sup>13,14,16</sup> resulting in friction-free excursive movements that limit wear on teeth and activate low levels of excursive muscle function.<sup>47</sup>
9. The canines are best suited to accepting the horizontal forces that occur during eccentric movements.<sup>40,45,48</sup> This is because:
  - a) They have the longest and the largest roots and therefore the best crown/root ratio.<sup>44,49</sup>
  - b) They are surrounded by dense compact bone, which tolerates the forces better than the medullary bone found around the posterior teeth.<sup>50</sup>
  - c) The canines are centred on sensory input and the resultant effect on the muscles of mastication. Apparently, fewer muscles are active when the canines contact during eccentric movements than when posterior teeth contact.<sup>51,52</sup>
  - d) Lower levels of muscular activity would decrease forces to the dental and joint structures, minimising pathosis. It is therefore suggested that during force finishing of left or right laterotrusive excursive movements, canine guidance is the preferred excursive control in order to best dissipate any damaging horizontal forces. When canine guidance cannot be achieved during case finishing, the most favourable alternative to canine guidance is group function. The most desirable group function consists of the canines, premolars and sometimes the mesiobuccal cusp of the first molar. Any laterotrusive contacts other than the mesial portion of the first molar are not desirable because of the increased amount of muscle force that can be created as the contact nears the fulcrum (temporomandibular joint).<sup>16</sup>

**Fig. 6**

refining the micro-aesthetic components of the smile. Cosmetic dentists spend their clinical time and effort rather on the aesthetics of the final result. This is because, aesthetic components are visible to both the clinician and patient, and the outcome can thus be appreciated immediately.

However, the force components are invisible, and their negative effects are not easily appreciated clinically until the effects become chronic. Another reason that force finishing may be overlooked is that it requires special tools and clinical techniques to demonstrate and measure the force factors clinically. Therefore, force is the most neglected component in cosmetic dentistry during case finishing.

In cosmetic dentistry, forces are finished based on articulating paper mark interpretation and the patient's proprioception feedback. It has been documented in the literature that articulating paper is a poor indicator of occlusal disharmony,<sup>3–5</sup> and studies have shown that mark size varies with the same applied load, with differing thickness of paper, surface texture of tooth and restorations, and that mark interpretation is an operator-based subjective procedure. Moreover, paper cannot measure the timing of occlusal forces.<sup>3–6</sup>

A proper case-finishing protocol must be based on both subjective and objective analysis. In order to measure the occlusal load and timing of occlusal forces, it is necessary to use proper tools, which can measure precisely and objectively the necessary occlusal parameters required in cosmetic case finishing. Computerised instrumentation to analyse occlusal forces was introduced by Tekscan Inc in 1984 as T-Scan I.<sup>7</sup> Over the past 27 years, it has evolved to become a very precise diagnostic and treatment tool that is used to manage the force components in any conventional case-finishing approach to dentistry.

Every clinical case is different, as it is related to the patient's state of health, his or her functional requirements, and his or her aesthetic needs and desires. Function is directly related to the forces that a patient generates within his or her stomatognathic system. There are four different theories of occlusion. Each of these theories has their value, and treatments that are founded on each have been successful. These theories of occlusion differ in their consideration of the positioning of the jaw or temporomandibular joint during treatment, which are known as jaw-position theories (Fig. 4).





Fig. 7

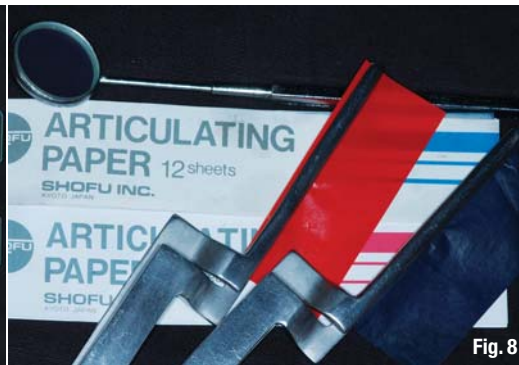


Fig. 8

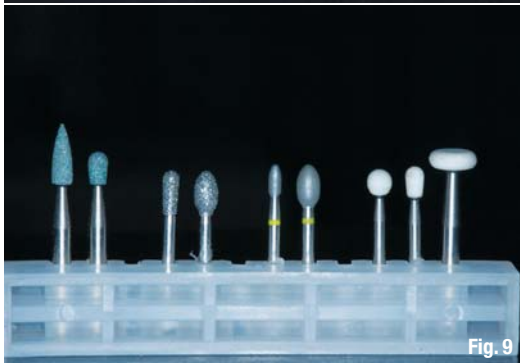


Fig. 9

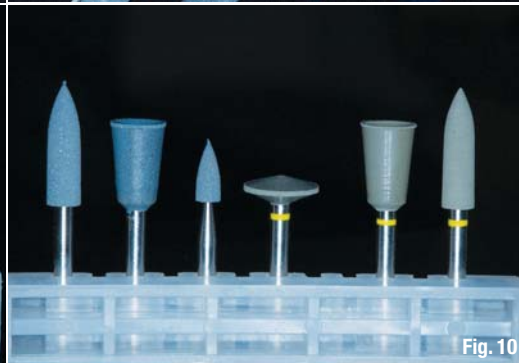


Fig. 10

**Fig. 7**\_T-Scan III: Digital occlusal analysis tool used to measure occlusal force percentage and tooth-contact timing.

**Fig. 8**\_Articulating paper with holder, a necessary item for locating the tooth-contact point and surface area during force finishing.

**Fig. 9**\_Dura-Green stones, Diamond points and Dura-White stones (all Shofu) can be used to contour the pressure spots selectively during force finishing.

**Fig. 10**\_Diamond-impregnated silicone points to finish and polish the contoured tooth and restoration surfaces.

However, all of these theories agree on the following issues:

1. Teeth during mandibular closure: All teeth should occlude simultaneously in mandibular closure movement.<sup>13-16</sup>
2. Occlusal load distribution on arch: An equal percentage of occlusal force should be shared between the right and left arch halves.

3. Occlusal load on tooth: An equal percentage of occlusal force should be distributed on each tooth counterpart.
4. Excursive contacts: The anterior teeth should immediately disclude the posterior teeth during excursive movements.<sup>13-16</sup>

Based on the laterotrusive movements from centric occlusion, various concepts of functional

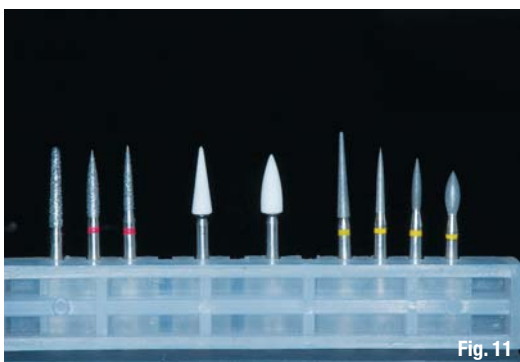


Fig. 11



Fig. 12



Fig. 13



Fig. 14

**Fig. 11**\_Diamond points and Dura-White stones to contour and texture the tooth and restoration surfaces.

**Fig. 12**\_Diamond-impregnated silicone points to finish and polish the contoured tooth and restoration surfaces.

**Fig. 13**\_Super Snap disk and strips (Shofu): For labial and interdental surface finishing and polishing.

**Fig. 14**\_Diamond paste, diamond-impregnated silicone points and a Robinson brush are used to achieve super polishing or enamel-like lustre of the restoration and tooth surfaces.

**Fig. 15** \_Aesthetic-finishing clinical facts.

1. A rough restoration surface allows dental plaque to adhere, which can promote secondary caries and periodontal diseases.<sup>54</sup> As the free surface energy of uneven surfaces is lower than that of smooth surfaces, micro-organisms can easily adhere and colonise.<sup>55, 56</sup> As a result, susceptibility to soft-tissue infection and caries can increase.<sup>57, 58</sup>
2. The rough surface of the final restoration promotes marginal restoration discoloration,<sup>59-61</sup> which can decrease the aesthetic quality of the restorations.<sup>62</sup>
3. Surface gloss plays an important role in the appearance of tooth-coloured restorative resins<sup>63</sup> and is a desirable characteristic that allows restorative materials to better mimic the appearance of the enamel.<sup>64, 65</sup>
4. A smooth and well-polished surface improves the flexural strength of the restorations and decreases abrasion of the opposing teeth.<sup>66, 67</sup>
5. The quality of intra-oral aesthetic finishing depends on the restorative materials used, finishing techniques, finishing tools and materials selected, and skill of the operator.
6. The quality of polishing of the restoration surfaces is vital for long-term health, function and aesthetics of the oral tissue.

**Fig. 15**

occlusion have been recognised and advocated: balanced occlusion,<sup>17, 18</sup> canine-protected occlusion,<sup>19-26</sup> group-function occlusion,<sup>27-31</sup> mixed canine-protected and group function,<sup>32</sup> flat-plane (attrition) occlusion,<sup>33, 34</sup> biological (multi-varied, physiological) occlusion.<sup>35</sup> However, no single type of functional occlusion has been found to predominate in nature and there appears to be no scientific evidence to support one occlusal scheme over other.<sup>36</sup>

Therefore, the literature and research findings, along with individual clinical experiences and accepted parameters of care, should always be considered in selecting the occlusal scheme during cosmetic dental treatment. Case-finishing procedures should not be based on a one-size-fits-all concept, and must be customised and designed according to the patient's aesthetic desires, functional requirements and physiological limits.

**Fig. 16a-d** \_A dental loupe, T-Scan III, BioJVA (jaw vibration analysis), BioEMG (electromyography) and digital SLR camera are used as the guiding tools to evaluate the force-finishing quality.



**Fig. 16a**



**Fig. 16b**



**Fig. 16c**



**Fig. 16d**

MCCF integrates the concept of force finishing into the conventional case-finishing protocol in the hope that it will help practitioners to achieve long-term optimum results in terms of health, function, aesthetics and patient satisfaction with minimal biological cost. MCCF consists of three clinical components:

- \_force finishing;
- \_aesthetic finishing; and
- \_finishing evaluation.

### **\_Force finishing**

The concept of force finishing is new in cosmetic dentistry and should not be confused with the conventional occlusal equilibration or occlusal adjustment process. The concept of force finishing is based on the universal principles of force balance and force loading timing during dynamic occlusion. In order to achieve precise force finishing in restorative dentistry, clinicians need to plan the occlusal goals. This is required because the force-finishing steps alone cannot refine the major occlusal discrepancies of the patient.

Hence, proper jaw positioning, angulation and establishment of tooth form (natural anatomy) must be completed before proceeding to

MCCF. There are five areas of the occlusal scheme in which clinicians can affect the force components (Fig. 5).

The force-finishing component of MCCF requires the use of digital occlusal technology that can measure precisely and objectively clinical occlusal force data, while displaying the findings for clinical interpretation and treatment.

The objective and precise clinical data helps clinicians to achieve tooth-contact forces and tooth-contact timing sequences that are preservational, rather than destructive, regarding the final case result. However, in cosmetic dentistry, the role of force finishing is generally overlooked, minimised or ignored.

The following are some of the clinical problems that clinicians encounter when they ignore or are unable to harmonise occlusal forces after treatment:

- \_ damaged restorations (veneers, onlays, crowns, bridges);
- \_ fractured teeth;
- \_ tooth mobility;
- \_ abnormal tooth wear and sensitivity;
- \_ pain in the teeth, muscles and jaw joints; and
- \_ increased neck pain, ear pain and headache.

In order to achieve the quality force-finishing results in dentistry, the following clinical conditions must be fulfilled during the force-finishing process:

- \_ even and simultaneous contacts of all teeth during mandibular closure;
- \_ distribution of nearly equal force percentage between the right and left arch halves;
- \_ distribution of more tooth-contact forces on posterior teeth, less on premolar teeth, with only light anterior contacts;
- \_ the centre of force (COF) should be in the middle of the distribution of all contacting teeth;
- \_ the anterior teeth should immediately disclude the posterior teeth during excursive movements.<sup>13-16</sup>

Optimally, after proper force finishing, all teeth should come into contact with one another at about the same time and with harmonised occlusal forces and measurably short disclusion timing. When this does not occur, the clinical case is considered to be unbalanced and poorly force finished. Force-finishing clinical facts are shown in Figure 6.

| Clinical steps   | Finishing tools                | Guiding tools  |
|--|--------------------------------|--|
| <p><b>Step I: Aesthetic finishing</b></p> <p><b>Aesthetic contouring:</b></p> <ol style="list-style-type: none"> <li>1. Reproduce natural size, shape and other details of the tooth form.</li> <li>2. Re-establish normal and functional contact with adjacent and opposing teeth.</li> </ol> <p><b>Finishing:</b></p> <ol style="list-style-type: none"> <li>1. Establish an even, well-adapted junction between the tooth surface and the restorations.</li> </ol> <p><b>Aesthetic touch-up:</b></p> <ol style="list-style-type: none"> <li>1. Achieve natural surface details through texture, grooves, pits and other special surface effects.</li> </ol> <p><b>Polishing:</b></p> <ol style="list-style-type: none"> <li>1. Pre-polishing: Remove the remaining surface scratches after the aesthetic touch-up process.</li> <li>2. Polishing: Establish a blemish-free and smooth surface with no visible scratches on the restoration.</li> <li>3. Super polishing: Polish restoration to enamel-like lustre.</li> </ol> | <p>Aesthetic-finishing kit</p> | <p>_ Dental loupe<br/>                 _ Digital images<br/>                 _ Digital X-ray<br/>                 (to check restoration marginal fit, finishing and overhangs)</p> |
| <p><b>Step II: Finishing evaluation</b></p> <ol style="list-style-type: none"> <li>1. Evaluate aesthetics, health (dental and gingival) and comfort status.</li> <li>2. Document the final case-finishing results digitally.</li> </ol>  | <p>Aesthetic-finishing kit</p> | <p>_ Dental loupe<br/>                 _ Digital images</p>  |

Table I

### \_ Aesthetic finishing

The aesthetic outcome is one of the major concerns of all patients seeking cosmetic dental treatment. The aesthetic-finishing process in cosmetic dentistry involves establishing high surface gloss and creating proper micro-smile aesthetic characteristics. These include proper tooth-size ratio, axial inclination, open incisal embrasures, proper connector location, proper contact-point progression, surface micro-texture, surface gloss or lustre, inciso-gingival shade progression, and special surface effects on the facial surfaces.

Additionally, gingival aesthetic characteristics to incorporate during case finishing are the control of tissue contour, embrasure heights, gingival zenith, and the establishment of uniform height (position or level) of the tissue around all the restorations.

In order to improve the practicality of clinical aesthetic case-finishing procedures, the procedures are divided into four clinical steps:

- \_ **Aesthetic contouring:** The restoration is grossly reduced for the reproduction of the natural size, shape and other details of the tooth form.<sup>53</sup> Re-establishing the contact with ad-

Table I\_Type I MiCD case-finishing protocol.



| Clinical steps   | Finishing tools         | Guiding tools  |
|--|-------------------------|--|
| <p><b>Step I: Force finishing</b></p> <p><b>During centric closure movement:</b></p> <ol style="list-style-type: none"> <li>1. Bring all the teeth into occlusal contact by selective contouring.</li> <li>2. Measure tooth-contact forces and timing sequences on the restorations.</li> <li>3. Adjust early contacts to delay them from contact, which improves contact simultaneity.</li> <li>4. Adjust high contact forces on the restoration.</li> <li>5. Adjust tooth-contact forces on restoration selectively until force equality is established throughout.</li> </ol> <p><b>During excursive movements:</b></p> <ol style="list-style-type: none"> <li>1. Check for prolonged frictional contacts on the restorations during right, left and protrusive movements.</li> <li>2. Remove all prolonged frictional contacts on the restorations.</li> </ol> | Force-finishing kit     | <ul style="list-style-type: none"> <li>_ T-Scan III</li> <li>_ Articulating paper</li> </ul>   |
| <p><b>Step II: Aesthetic finishing</b></p> <p><b>Aesthetic touch-up:</b></p> <ol style="list-style-type: none"> <li>1. Achieve natural surface details through texture, grooves, pits and other special surface effects.</li> </ol> <p><b>Polishing:</b></p> <ol style="list-style-type: none"> <li>1. Pre-polishing: Remove the remaining surface scratches after the aesthetic touch-up process.</li> <li>2. Polishing: Establish a blemish-free and smooth surface with no visible scratches on the restoration.</li> <li>3. Super polishing: Polish restoration to enamel-like lustre.</li> </ol>  | Aesthetic-finishing kit | <ul style="list-style-type: none"> <li>_ Dental loupe</li> <li>_ Digital images</li> <li>_ Digital X-ray (to check restoration marginal fit, finishing and overhangs)</li> </ul> |
| <p><b>Step III: Finishing evaluation</b></p> <ol style="list-style-type: none"> <li>1. Evaluate aesthetics, health (dental and gingival) and comfort status.</li> <li>2. Confirm force-finishing end-results.</li> <li>3. Document the final case-finishing results digitally.</li> </ol>  |                         | <ul style="list-style-type: none"> <li>_ Dental loupe</li> <li>_ Digital images</li> <li>_ T-Scan III</li> </ul>   |

**Table II**

**Table II\_Type II MiCD case-finishing protocol.**

adjacent opposing teeth to a normal and functional form is achieved in this step.<sup>53</sup>

**\_Finishing:** This is a finishing process to establish an even, well-adapted junction between the tooth surface and the restorations.

**\_Aesthetic touch-up:** Necessary minor adjustments to achieve natural surface details through texture, grooves, pits and other special surface effects.

**\_Polishing:** This step entails smoothing restorations to an enamel-like lustre. For clinical convenience, this process can be further divided into three steps:

- a) pre-polishing: removing the remaining surface scratches from the aesthetic touch-up process;
- b) polishing: achieving blemish-free and smooth surfaces with no visible scratches;
- c) super polishing: creating enamel-like lustre or gloss.

Aesthetic-finishing clinical facts are shown in Figure 15.

## **\_Finishing evaluation**

Post-operative clinical evaluation is one of the fundamental requirements of the keep in touch principle of the MiCD treatment protocol.<sup>1</sup> Generally one week after the case finishing, the case should be re-evaluated in terms of health, comfort and aesthetics through clinical examination, digital images and other necessary guiding tools. The end-result of force finishing should be re-confirmed before final case documentation.

## **\_MiCD customised case-finishing protocol**

Based on the patient's aesthetic wishes and level of sensitivity towards the occlusal force components (tooth-contact forces and timing sequences), MCCF can be divided into three clinical types:

**\_Type I:** In cases in which forces are not part of creating the aesthetic case changes, as well as cases of non-load-bearing anterior and posterior restorations, tooth-whitening procedures, reductive and additive contouring (both the teeth and gingival tissues) if correction does not alter the existing occlusal scheme, these cases are generally finished according to the type I MCCF protocol (Table I).

**\_Type II:** When aesthetic cases are sensitive to tooth-contact forces because a major restoration is being fabricated on the load-bearing areas of the anterior or posterior teeth (as when utilising inlays, onlays, overlays, crowns and bridges, veneers, dentures, or performing a re-restoration of frequently fractured restorations), force-finishing procedures should precede aesthetic case finishing. This will improve the long-term clinical success of the restoration and create effective functional health. Force finishing in type II cases requires the use of digital technology (T-Scan III) that can measure and display the underlying tooth-contact forces precisely and objectively. The type II MCCF finishing protocol is shown in Table II.

**\_Type III:** Complex aesthetic cases (full-mouth restoration, orthodontic treatment, implant restoration, cases with para-functional habits, restorations that alter the anterior guidance, cases with a known history of TMD symptoms) require significant tooth-contact force and

timing management. In these complex restorative cases, force finishing is performed before aesthetic finishing is accomplished in order to achieve enhanced occlusal function and ideal aesthetics, combined with teeth, muscle and joint harmony. The type III MCCF protocol is shown in Table III.

All three types of force finishing should always be in harmony with the aesthetic results. After force finishing, the micro-aesthetic elements should be re-examined, and cases should be completed with the necessary aesthetic touch-ups, and super polishing of all restorations. It should be remembered that the force-finishing process should be followed by aesthetic finishing to complete the case successfully.

### Conclusion

In the performance of cosmetic dentistry, the force components are frequently neglected or misunderstood. Therefore, the physical strength of the tooth-coloured restorative materials is still an important topic in cosmetic dentistry. The restorative materials chosen are often much stronger than the natural teeth because the clinician hopes the materials selected will overcome potential fracture of the restorations.

However, it is necessary to understand that the highly concentrated occlusal force locations within the occlusal scheme may not always fracture the restorations, but will create other problems with the teeth, muscles and/or joints in some patients. Therefore, if the clinician overcomes fracture of the restorations through material choice, he or she may actually be ignoring the underlying force factors.<sup>68</sup>

It is to be noted that whatever the theory or concept of occlusal scheme selected during the treatment procedure, the role of MCCF is paramount to achieving long-term optimum results in terms of health, function, aesthetics and high patient satisfaction with minimal biological cost.

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

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| Clinical steps  | Finishing tools         | Guiding tools   |
|---|-------------------------|---|
| <p><b>Step I: Force finishing</b></p> <p><b>During centric closure movement:</b></p> <ol style="list-style-type: none"> <li>1. Bring all the teeth into occlusal contact by selective contouring.</li> <li>2. Measure tooth-contact forces and timing sequences.</li> <li>3. Adjust early high-pressure points, one by one.</li> <li>4. Equalise right and left arch-half force percentage.</li> <li>5. Distribute nearly equal force percentage on each posterior tooth counterpart, one by one (i.e. left first molar region should nearly equal right first molar region force percentage).</li> <li>6. Keep light tooth contacts (lower force percentage) in the anterior region.</li> <li>7. Check the location of COF and bring it down the midline and to the centre of the distribution of all contacting teeth.</li> <li>8. Achieve simultaneous contacts of all teeth during mandibular closure.</li> <li>9. Adjust tooth-contact timing of implant restorations selectively to delay them from making initial occlusal contact until after the nearby (to the implants) natural teeth make moderate occlusal contact.</li> </ol> <p><b>During excursive movements:</b></p> <ol style="list-style-type: none"> <li>1. Check for prolonged frictional contacts on the restorations during right, left and protrusive movements.</li> <li>2. Remove all prolonged frictional contacts on the restorations so that the disclusion time is reduced.</li> <li>3. Achieve canine-protected guidance whenever possible.</li> </ol> | Force-finishing kit     | <p>_ T-Scan III</p> <p>_ Articulating paper</p>   |
| <p><b>Step II: Aesthetic finishing</b></p> <p><b>Aesthetic touch-up:</b></p> <ol style="list-style-type: none"> <li>1. Achieve natural surface details through texture, grooves, pits and other special surface effects.</li> </ol> <p><b>Polishing:</b></p> <ol style="list-style-type: none"> <li>1. Pre-polishing: Remove the remaining surface scratches after the aesthetic touch-up process.</li> <li>2. Polishing: Establish a blemish-free and smooth surface with no visible scratches on the restoration.</li> <li>3. Super polishing: Polish restoration to enamel-like lustre.</li> </ol>   | Aesthetic-finishing kit | <p>_ Dental loupe</p> <p>_ Digital images</p> <p>_ Digital X-ray (to check restoration marginal fit, finishing and overhangs)</p> |
| <p><b>Step III: Finishing evaluation</b></p> <ol style="list-style-type: none"> <li>1. Evaluate aesthetics, health (dental and gingival) and comfort status.</li> <li>2. Confirm force-finishing end-results.</li> <li>3. Document the final case-finishing results digitally.</li> </ol>   |                         | <p>_ Dental loupe</p> <p>_ Digital images</p> <p>_ T-Scan III</p> <p>_ JVA</p> <p>_ EMG</p>                                       |

Table III

\_about the author



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Table III\_Type III MiCD case-finishing protocol.

# Evolving conservative dentistry

Author\_Dr George Freedman, Canada



Fig. 1

A mere 20 years ago, fourth-generation adhesives revolutionised restorative dentistry by offering a predictable technique for bonding to both enamel and dentine.<sup>1</sup> Less than five years later, advances in ionomer and resin technologies provided clinically successful dentine and enamel replacement. In 2003, the first selective preparation burs able

to differentiate between healthy and unhealthy dentine were introduced.<sup>2</sup> These were all revolutionary innovations that altered the practice of dentistry significantly. Within a decade, adhesive resin and composites had displaced amalgam as the mainstream restorative materials.

The intervening years have seen the development of improved fifth- and seventh-generation adhesives,<sup>3,4</sup> micro-hybrid and nano-hybrid composites, LED curing lights, soft-tissue lasers,<sup>5-7</sup> and a host of other adjunct technologies that make dental treatment better, easier, faster<sup>8</sup> and more predictable.<sup>9,10</sup> These innovations have been evolutionary, rather than revolutionary, building upon the existing science through gradual improvement and facilitation.

The three major clinical concerns encountered by practitioners in recent years have included:

- \_the end-point of cavity preparation (how to differentiate between infected and affected dentine and how much tooth structure to remove to ensure long-term operative success);<sup>11-13</sup>
- \_the disinfection of the prepared dental tissue (how to eliminate the remaining bacteria to prevent re-decay);<sup>14,15</sup> and
- \_the facilitation and simplification of the restorative protocol (how to reduce the numerous steps and technique sensitivities that arise in the restoration of function and form).

Recent technological advances have done much to allay these concerns and to move dental practice towards ever greater clinical predictability.

## \_Preparation end-point

Second-generation Smart-Burs II (SS White) are self-limiting polymer burs developed to address the clinical problem of the preparation end-point: the removal of *infected*

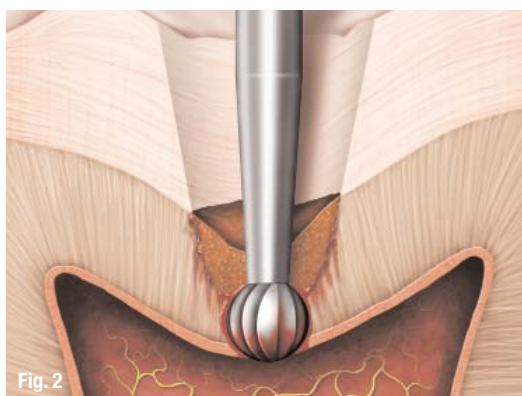


Fig. 2

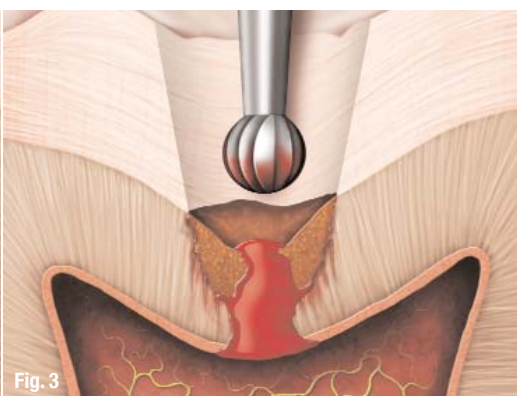


Fig. 3



Fig. 4

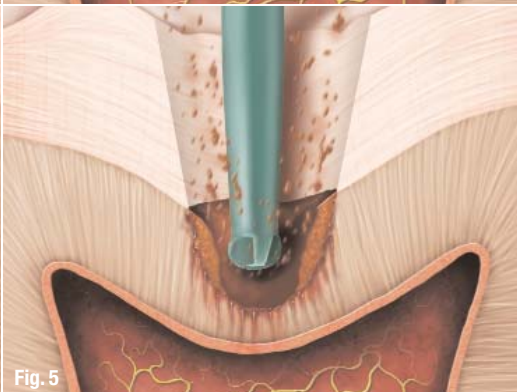


Fig. 5





dentine (softened tooth structure that cannot be remineralised)<sup>16</sup> and the preservation of *affected* dentine (infected tooth structure that can be healed and remineralised; Fig. 1). The slow-speed Smart-Burs II relies on the hardness of the tooth structure, and not tissue staining, to determine the end-point scientifically. Its specifically designed Knoop hardness (harder than diseased dentine but softer than healthy dentine) allows the bur to remove soft carious dentine selectively while not cutting the harder healthy dentine.

A carbide or diamond bur can inadvertently penetrate through the thin remaining dentine into the pulp (Figs. 2 & 3). SmartBurs II, however, is degraded by healthy dentine and ceases to cut (Figs. 4 & 5). These burs are used after the initial caries access preparation has exposed the deep, underlying caries. In cases in which the caries is exposed (Fig. 6), these instruments can typically be utilised without the need for local anaesthetic because they do not traumatise or open healthy dentinal tubules (Fig. 7).

### Cavity disinfection

It is well established that some bacteria remain in the prepared tooth structures, no matter how thorough the preparation process, and despite a tactile firmness and non-stained appearance. It is now possible to greatly decrease the likelihood of viable bacteria beneath the restoration by chemotherapeutic methods that can penetrate as far as 2 to 3 mm into the remaining enamel or dentine. These techniques effectively destroy bacterial viability and permit the subsequent remineralisation of compromised tooth structures.

The technologies that have been shown to be effective surface bactericides are:

ASEPTIM Plus Photo-Activated Disinfection system (SciCan; Fig. 8):<sup>17</sup> This compact unit

utilises toloum chloride to stain liposomes specifically in bacterial cell walls. The stain is subsequently targeted by a red diode light that releases oxygen ions (Fig. 9). These ions break the liposomes open, rupturing the cell walls, and killing the bacteria.

The ions are immediately, and selectively, toxic to bacteria. A very low level of ozone concentration is required for a comprehensive bactericidal effect.<sup>18-20</sup>

HealOzone (CurOzone USA; Fig. 10): The ozone ions are generated remotely and introduced to the tip-sealed tooth surface through a handpiece. The high concentration of ozone is very effective in bacterial wall disruption and destroys bacteria within 20 to 40 seconds (Fig. 11).<sup>21-24</sup> HealOzone unit is available at [www.ukdent.com](http://www.ukdent.com).

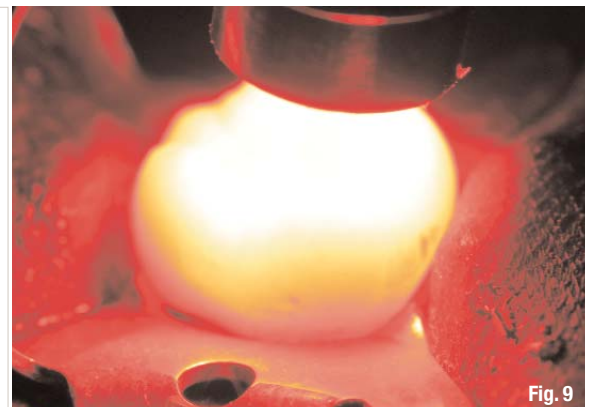




Fig. 12



Fig. 13



Fig. 14

### Simplification of the restorative protocol

Most restorative protocols require numerous materials, each selected for particular beneficial properties, numerous steps and a cumulatively complex description of the specific sequence that must be followed exactly.

For example, micro-hybrid composites have excellent compressive strength for occlusal surfaces, *but* they may not flow and adapt to margins and undercut areas of the preparation and can be difficult to sculpt. Flowable composites can adapt readily to the micro-anatomy of the tooth surface and are very polishable *but* cannot withstand the masticatory forces of direct occlusal contact.

Beautiful Flow Plus (SHOFU) introduces a new category of restorative material: the "injectable" flowable composite resin (Fig. 12). Based on giomer chemistry, it is neither a conventional composite nor a flowable resin; Flow Plus is a unique blend of these materials with the benefits of both. Its high-strength resin matrix is densely packed with fillers optimised to 67 per cent.

Beautiful Flow Plus has a higher yield point than other flowables; thus, it is not deformed by the strong occlusal forces placed on the posterior teeth. Owing to its excellent physical properties, Beautiful Flow Plus is indicated for restoring both anterior and posterior teeth, and it is suitable for the occlusal surfaces of posterior teeth.

Two viscosities are available, a sculptable non-flow F00 (Fig. 13) and a low-flow F03 (Fig. 14), which are used together in the resin cone technique. Both are suitable for the occlusal surfaces of posterior teeth. The highly elastic Beautiful Flow F 10 is placed after the adhesive for interface stress relief. Then, the non-flow is injected to form cusps and marginal ridges. It injects smoothly from the syringe, retains its shape, and does not develop a dispensing horn. Beautiful Flow Plus is not subject to technique sensitivity, and the cone injection technique offers an important time advantage when compared with the layering technique. Beautiful Flow Plus F 03 is placed last to finalise the occlusal anatomy of the restoration and to seal the marginal areas.

Used individually, or preferably together, these innovative techniques and materials provide prac-



Fig. 17



Fig. 15



Fig. 16

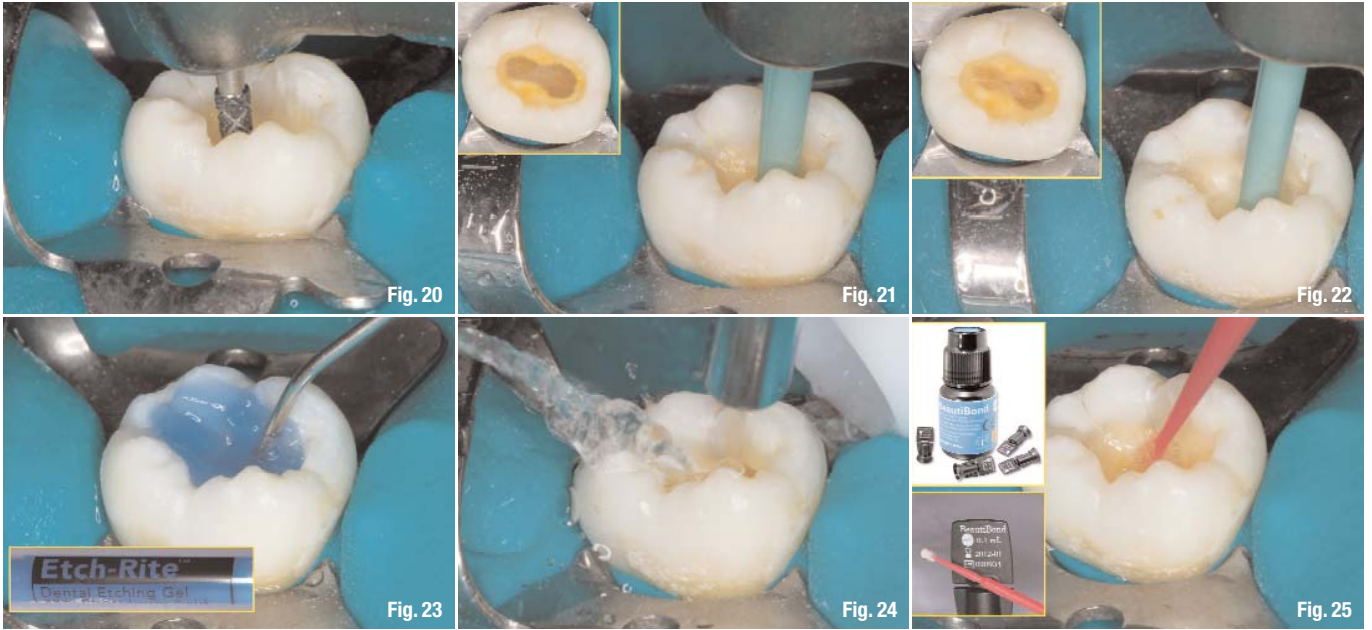


Fig. 18



Fig. 19





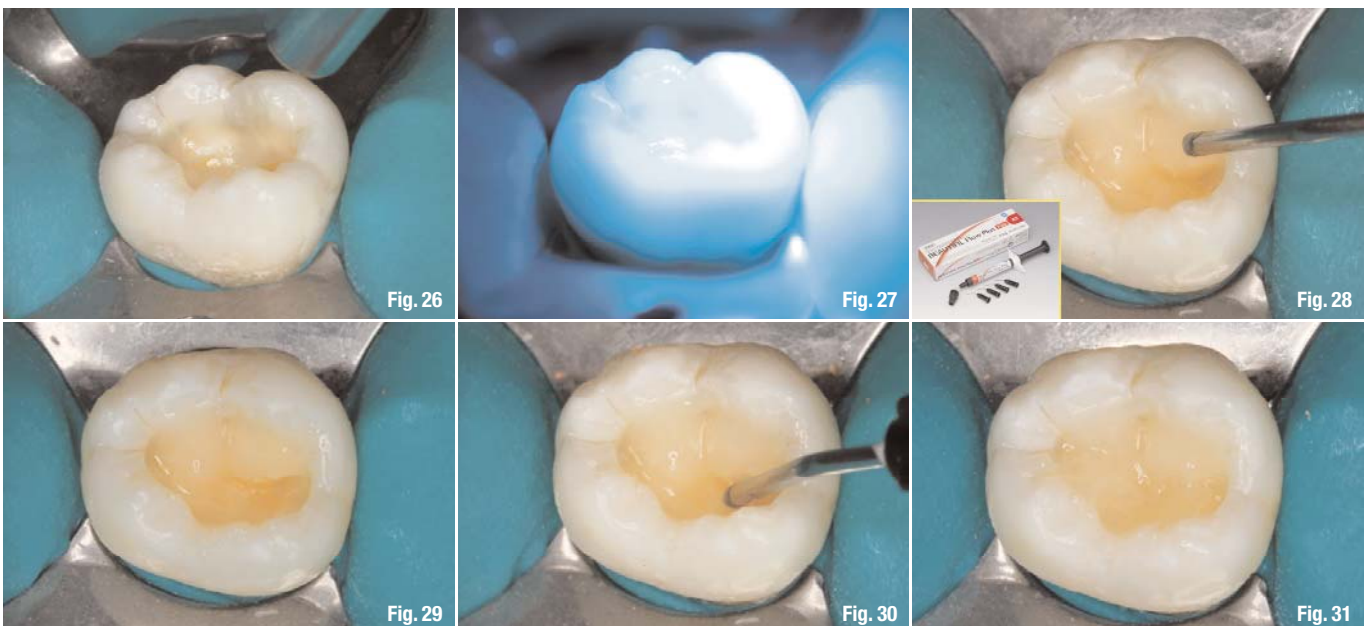
tical clinical solutions to the concerns listed above. The following section details step-by-step an effective protocol that incorporates the latest advances in restorative dentistry.

### Clinical protocol

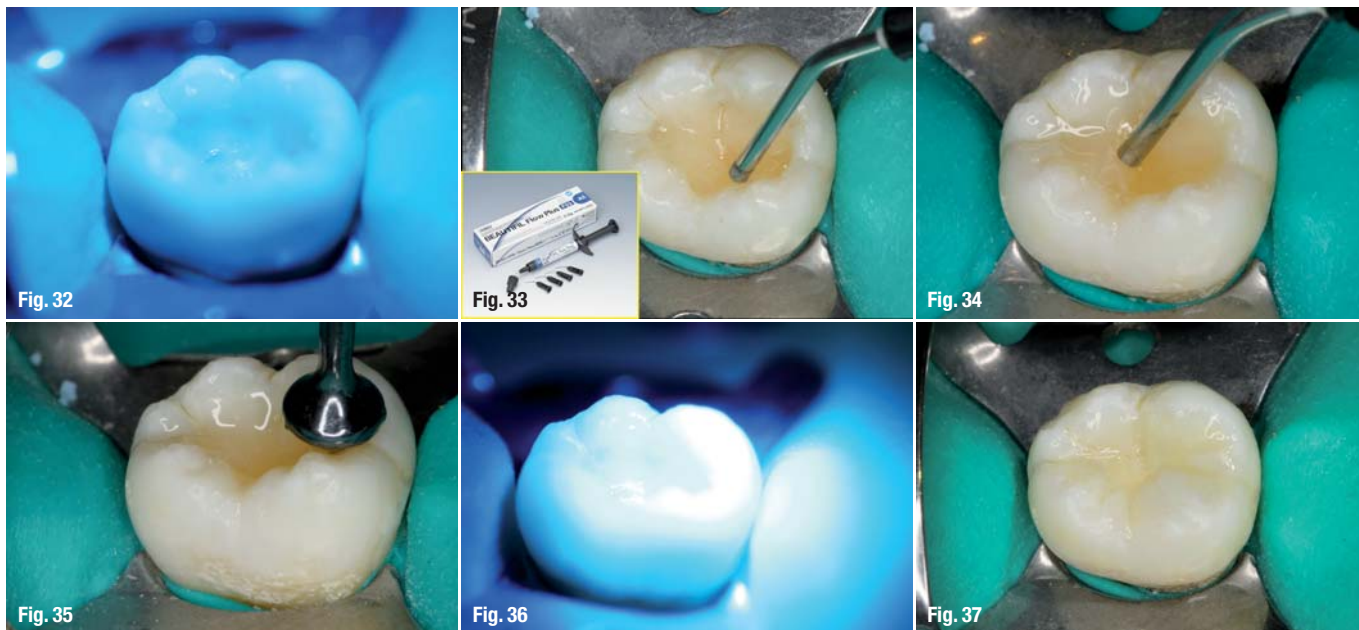
The rubber dam is punched and lubricated with water-soluble Wink (Pulpdent; Fig. 15) to facilitate its insertion through interproximal contacts without tearing. Vita Easyshade Compact (Vident) is used to determine the shade of the restorative material at the beginning of the procedure, either before the rubber dam is placed, or immediately afterwards (Fig. 16). It is important to record the shade while the tooth is still moist; once it is desiccated, the tooth

will appear unnaturally chalky and opaque. The tooth is air-dried and the CarieScan PRO caries indicator (CarieScan; Fig. 17) is utilised to confirm the location and the extent of the decay (Fig. 18).<sup>25-28</sup>

Access through the enamel is created with a Great White Gold #2 carbide<sup>29</sup> (Fig. 19) or a TDA #849 diamond high-speed bur (Fig. 20; both from SSWhite).<sup>30</sup> Once the deep decay has been exposed, SmartBurs II selectively removes the soft carious (infected) dentine (Fig. 21). The structure of SmartBurs II is designed to determine the preparation end-point automatically; any further rotation of the bur in the cavity simply abrades the bur, not the dentine. This leaves the harder, remineralisable (affected) dentine covering the pulp chamber intact (Fig. 22).







The restorative process begins with an optional etching step; seventh-generation adhesives do not require a separate etching step. A brief etch, 15 seconds or less, is unlikely to harm the bonding strength of the dental surfaces. Etch-Rite (Pulpdent) is applied to the enamel first and then the dentine (Fig. 23) and rinsed off with copious water less than 15 seconds later (Fig. 24). Then, the prepared tooth surfaces are disinfected with the ASEPTIM Plus, Ozonix or Healozone. Each of these treatments takes one minute or less of chair time, and offers greatly improved restorative predictability. BeautiBond seventh-generation single-component, single-step adhesive (SHOFU) is applied to all prepared dentinal and enamel surfaces (Fig. 25). It is left undisturbed for ten seconds, and is then completely dried with an oil-free air syringe (Fig. 26). BeautiBond is then polymerised with a FUSION high-power LED curing light (DentLight; Fig. 27).

Next, the cavity is filled utilising the innovative resin cone technique (as opposed to the more laborious and time-consuming layering technique). Sculptable Beautiful Flow Plus F00 is injected onto the bonded surface of the preparation (Fig. 28). The composite forms into cones at the bases of the buccal cusps (Fig. 29) as it adapts intimately to the preparation. Since Flow Plus F00 is a non-flow resin, it stays where it is placed until curing. Flow Plus F00 is then injected to form the cones at the bases of the lingual cusps (Fig. 30), from the cavity floor to the occlusal, until all four cusp bases have been restored (Fig. 31). The injected cones are then polymerised with the Fusion curing light (Fig. 32). Once the cone build-up is complete, Beautiful Flow Plus F03 is injected to seal the marginal areas (Fig. 33) and the valleys between the cones (Fig. 34). Flow Plus F03 is a low-flow material that can readily be shaped by the Duckhead in-


strument (Hu-Friedy; Fig. 35) prior to final light curing (Fig. 36). The Duckhead composite instrument minimises (and in many cases, eliminates) the need for occlusal adjustment and polishing, further improving the efficiency of the restorative protocol. The completed restoration (Fig. 37) demonstrates the clinical result of the technique and material enhancements that are available to the practitioner today.

### Conclusion

Innovations in end-point determination, cavity surface disinfection, and the simplification of restorative techniques have again revolutionised dental practice. Mainstream clinical procedures are better, faster, easier and much more predictable in the long term.

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

\_about the author
cosmetic  
dentistry



**Dr George Freedman** is past president of the American Academy of Cosmetic Dentistry and the Chairman of the Dental Innovations Forum (Singapore). He is the author or co-author of 11 textbooks, more than 400 dental articles, and numerous CDs, videos and audiotapes, and is a member of the REALITY editorial team. His most recent textbook is "Contemporary Esthetic Dentistry" (Elsevier). Dr Freedman is co-founder of the Canadian Academy for Esthetic Dentistry and a diplomate of the American Board of Cosmetic Dentistry.





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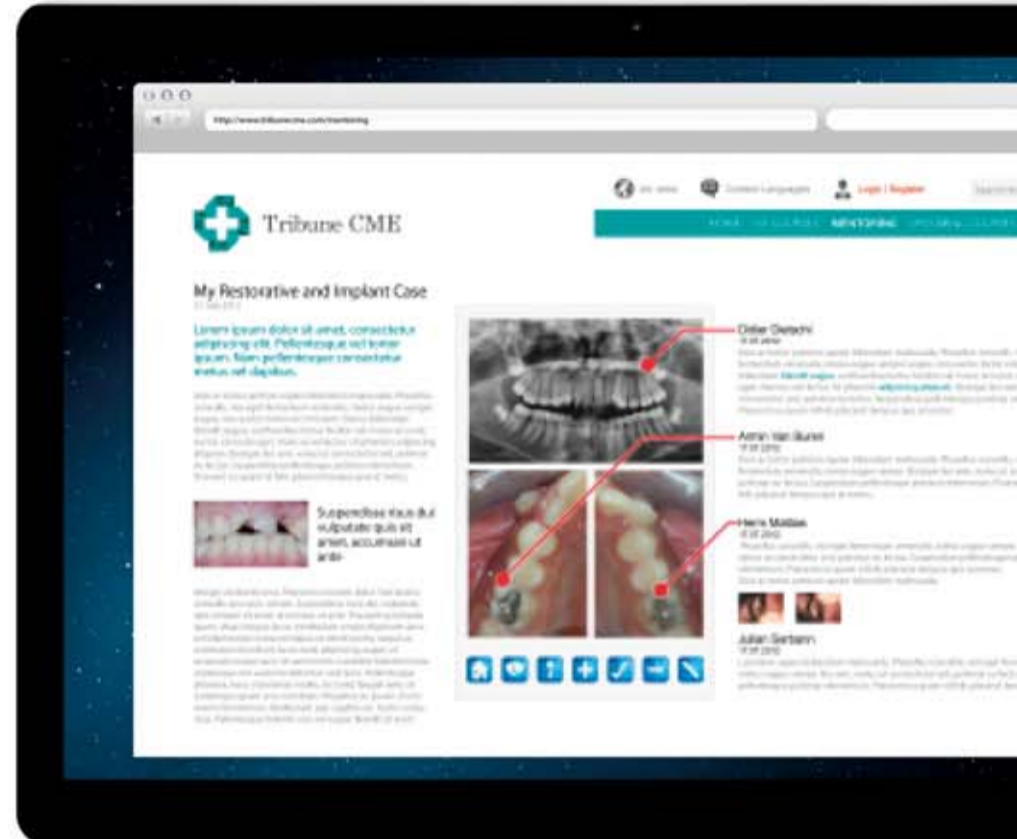
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# Enhancement of aesthetic treatment planning and communication using a diagnostic mock-up

Authors\_Drs Laurie St-Pierre, Canada, & Deborah S. Cobb, USA

Fig. 1\_Pre-op photograph of patient's smile (Case I).  
Fig. 2\_Pre-op intra-oral view (Case I).



Success in aesthetic dentistry relies largely on the ability to understand clearly the patient's chief complaint and expectations in seeking dental treatment to correct an aesthetic concern and to address them as fully as possible. Patients are increasingly demanding and may have expectations that exceed what can be achieved in reality. Moreover, aesthetics, being subjective, may not be based on the same criteria for both the patient and the dentist.

its limitations to help them understand what can realistically be achieved. Involving the patient in the decision-making process will yield invaluable information, leading to a mutually satisfying result.

Communication of the proposed restorative outcome between the patient and the dentist is essential, yet challenging. Levine<sup>1</sup> reports that one of the most common causes of failure in aesthetic dental treatment does not result from a technical issue but from a miscommunication between the dentist and the patient. There are various communication and diagnostic tools to

Therefore, it is strongly recommended that before any elective aesthetic treatment patients be enabled to visualise the projected result with

Fig. 3\_Diagnostic wax-up (Case I).  
Fig. 4\_Confection of a silicone putty matrix.  
Fig. 5\_Provisional material is placed into the silicone matrix impression.







Fig. 6



Fig. 7

Fig. 6\_Diagnostic mock-up (Case I).

Fig. 7\_Intra-oral view of diagnostic mock-up (Case I).

help patients understand and visualise the expected aesthetic outcome, with each having its limitations. These include diagnostic wax-ups, before and after pictures of other patients, computer imaging and direct mock-ups with composite resin.

The diagnostic wax-up is created by modifying the shape of teeth on a patient's diagnostic cast with the application of wax and by reducing the stone as needed. It is well known that this diagnostic tool is indispensable in complex aesthetic cases. It may be very helpful even in simpler cases. The diagnostic wax-up often reveals additional necessary treatment that was not evident during the clinical exam and is a dynamic visual and functional aid in achieving predictable results. It is highly recommended that the practitioner keep one duplicated cast unaltered for future reference and for comparison when explaining the treatment plan to the patient.

However, it might be difficult for the patient to envision the final result only by looking at a cast. Direct mock-up with composite resin may assist with visualisation, by the process in which composite resin is applied to the desired shape on dry and unetched teeth without application of adhesive and is therefore fully reversible.

A pilot study conducted by Dr Dov Almog et al.<sup>2</sup> compared these different communication techniques in cases of diastema closure, including before and after pictures of other patients, diag-

nostic wax-ups, direct mock-ups using composite resin on unetched teeth and computer-imaging simulation. Twenty-four patients, nineteen women and five men, were included in the study. Their results showed that computer-imaging simulation was the preferred method of visualisation (54.2 per cent) followed by direct composite resin mock-up (33.3 per cent), and before and after pictures of other patients (12.5 per cent). No patient indicated diagnostic wax-up as his or her preferred method of visualisation. While computer-imaging simulation allows for modification of pretreatment pictures to the desired outcome, it does not take into consideration factors such as occlusion and may not be reproducible clinically. Therefore, it should be used with caution.

Direct mock-up with composite resin was also preferred by patients for visualisation of expected aesthetic outcome. Direct mock-up can help in determining the correct shade for direct composite resin restorations and can serve as a practical chairside alternative to the diagnostic wax-up. It can also be used to create a lingual matrix for multilayered composite resin restorations. However, achieving the desired results with the direct mock-up can be quite time-consuming and costly with the use of composite materials as the mock-up medium.

An easy way to overcome these drawbacks while still using the same principle of applying material to teeth in a reversible manner has been described in the literature<sup>3-6</sup> and is called a diag-



Fig. 8



Fig. 9

Fig. 8\_Post-op photograph of patient's smile (Case I).

Fig. 9\_Post-op intra-oral view (Case I).

**Fig. 10**\_Pre-op photograph of patient's smile (Case II).

**Fig. 11**\_Pre-op intra-oral view (Case II).

**Fig. 12**\_Diagnostic mock-up (Case II).

**Fig. 13**\_Intra-oral view of diagnostic mock-up (Case II).



Fig. 10



Fig. 11



Fig. 12



Fig. 13

nostic template or a diagnostic mock-up. It is an advantageous diagnostic tool and a great communication method to help the patient visualise the anticipated outcome in three dimensions and intra-orally, with little clinical chair time required. The diagnostic mock-up technique entails making a silicone matrix from the diagnostic wax-up and filling it with an auto-cure resin temporary material before placing it intra-orally. The diagnostic mock-up is therefore a replica of the ideal wax-up of the desired restorative outcome. It is very practical when no major enameloplasty is required, since this would not allow the placement of the silicone matrix. This technique is especially useful for diastema closure, given that closing the spaces may in some instances change the patient's appearance dramatically.

A diagnostic mock-up is very simple to create. During the first patient visit, impressions are taken to create a diagnostic wax-up. A silicone impression is made from the diagnostic wax-up using a polyvinyl siloxane putty material to create

a matrix. At the next appointment, petroleum jelly is generously applied to the patient's teeth and surrounding gingiva and gently thinned with air. An auto-cure resin used for provisional material is placed into the silicone matrix impression and placed on the patient's teeth until fully polymerised. The excess material is then removed at the gingival margin using a #12 blade or a flame carbide or diamond bur. The patient can immediately see and appreciate the proposed result. The diagnostic mock-up can be removed simply by detaching the material with a spoon or other hand instrument.

The value of the diagnostic mock-up cannot be overemphasised because it can be achieved very quickly and relatively inexpensively. It also provides an opportunity for the operator to verify the contours of the restorations planned with the diagnostic wax-up, as well as the occlusal plane, the length and angulation of the teeth, their relation with the upper and lower lips at rest and when the patient smiles, the phonetics and the

**Fig. 14**\_Post-op photograph of patient's smile (Case II).

**Fig. 15**\_Post-op intra-oral view (Case II).



Fig. 14



Fig. 15



Fig. 16



Fig. 17

**Fig. 16**\_Pre-op photograph of patient's smile (Case III).

**Fig. 17**\_Pre-op intra-oral view (Case III).

overall shape of the teeth in relation to the patient's face. It can easily be modified chairside as required.

Moreover, the patient can see the expected result immediately and in some cases can leave the dental office with the diagnostic mock-up to show to family and friends. The diagnostic mock-up is also an invaluable tool to confirm that the dentist understands what the patient is seeking in terms of the aesthetic result, and to point out and discuss the limitations before any treatment is done, thus preventing post-treatment frustrations for both the patient and the dentist. It is therefore very helpful in cases in which a compromised outcome is expected.

The diagnostic mock-up is an integral part of diagnosis and treatment planning. It can easily be done at the appointment dedicated to discussing the treatment plan with the patient, immediately before the procedure or during bleaching appointments if the patient wishes to bleach his or her teeth prior to treatment. Most patients appreciate this option, which may enhance their motivation and cooperation, especially if the proposed treatment requires long or multiple appointments. It also can increase their confidence in the practitioner. The diagnostic mock-up as a chairside diagnostic approach enables the patient to better understand and participate in the treatment planning process and express his or her thoughts regarding the dentist's proposed outcome.

## \_ Case reports

### Case I

A 19-year-old female patient was concerned about her midline diastema and the misalignment of her maxillary incisors (Figs. 1 & 2). The patient had completed orthodontic treatment a few years before but the realignment relapsed. The patient refused any orthodontic treatment and was considering diastema closure and veneers. Her maxillary teeth exhibited short clinical crowns caused by altered passive eruption. Radiographs showed that the bone level was at the cemento-enamel junction. No other relevant findings or pathology was noted.

It was explained to the patient that crown lengthening was needed in order to retain the normal proportion of her maxillary incisors following diastema closure. The patient only wanted an improvement in the teeth shape and alignment and declined the periodontal surgery. It was explained that her central incisors would have a squared shape and would appear shorter and wider. In her case, a diagnostic mock-up was made in order to help her visualise the result and the limitations. Using the diagnostic wax-up (Fig. 3), a silicone putty matrix was confectioned (Fig. 4).

The matrix was filled with Protemp Plus material (3M ESPE; Fig. 5) and placed on lubricated teeth. After setting of the material and removal



Fig. 18



Fig. 19

**Fig. 18**\_Diagnostic mock-up (Case III).

**Fig. 19**\_Intra-oral view of diagnostic mock-up (Case III).



**Fig. 20**\_Post-op photograph of patient's smile (Case III).

**Fig. 21**\_Post-op intra-oral view (Case III).



of excess, the patient viewed the result and was pleased (Figs. 6 & 7). She did not request any modification. It was also an opportunity for the operator to evaluate the occlusal plane and it was decided to lengthen the left maxillary canine as well. Conservative treatment was then completed using Estelite Omega composite resin (Tokuyama Dental; Figs. 8 & 9).

*Case II*

A 12-year-old male patient presented with residual spaces post-orthodontic treatment (Figs. 10 & 11). While this case was relatively simple, a diagnostic mock-up was made in order to show the expected result to the patient and his relatives to see whether they would be satisfied (Figs. 12 & 13). Even with this relatively simple treatment, the patient and his parents were very pleased with the diagnostic mock-up and were motivated to proceed with the restorations. The treatment was completed as planned using Estelite Omega (Figs. 14 & 15).

*Case III*

A 28-year-old female patient presented with multiple diastemas between her maxillary anterior teeth (Figs. 16 & 17). She had recently completed orthodontic treatment to redistribute the space of a large midline diastema.

At her first visit, impressions were taken to make a diagnostic wax-up. In order to respect the tooth proportion, the length of the teeth needed to be increased, which would change the appearance of her teeth considerably. At the second appointment, the treatment plan was explained to the patient using the diagnostic wax-up and the unaltered original cast. A diagnostic mock-up was then quickly made to allow the patient to visualise the anticipated result (Figs. 18 & 19).

The patient was delighted and appreciated that we could show her the anticipated outcome with direct composite resin very quickly before per-

forming the treatment. Her motivation and cooperation were noticeably increased. The facial midline, teeth length and angulation, anterior occlusal plan, the relation of the teeth with the lower lip at smile and with the upper lip at rest and the phonetics were evaluated. The treatment was realised conservatively with Estelite Omega (Figs. 20 & 21).

**Conclusion**

A diagnostic mock-up is an important communication tool to assist patients in envisioning the proposed result. It also facilitates a two-way discussion: one way from the patient to express his or her desire regarding the proposed outcome and the other way from the dentist to verify the contours of the restorations and to explain the limitations, thus avoiding the frustration that may result from miscommunication. The diagnostic mock-up is a fairly simple and fast procedure that can enhance the satisfaction of both patient and dentist significantly.

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

|  |   |                              |
|--|---|------------------------------|
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# Simple layering technique with direct composite restorations

Author\_Dr Valdas Vilkinis, Lithuania

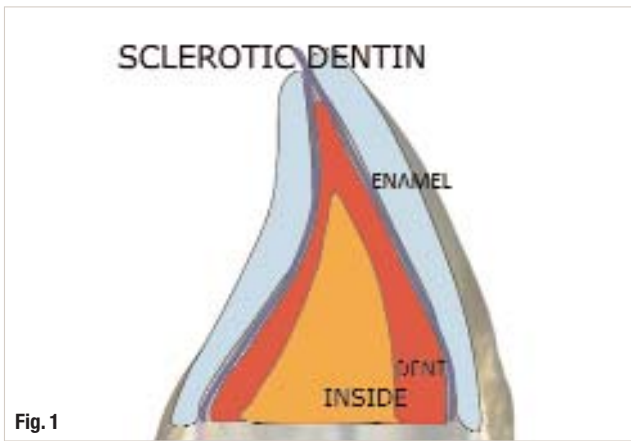


Fig. 1



Fig. 2

For many years, the trend in restorative dentistry has been to place only one- or two-shade composite restorations in daily practice. However, with this approach, it is difficult to achieve a satisfactory aesthetic result in anterior teeth. There are great variations in colour value (lightness or darkness), depending on the patient's age and enamel thickness, which affect the overall tooth colour. It has been proven that aesthetic restorations can only be achieved if the different values of natural enamel are recreated with composite material of a similar translucency.

In recent years, anatomic layering techniques have been advocated by various clinicians aiming to achieve a more natural-looking restoration. The essence of these techniques is similar: recreate lost tooth structure layer by layer using composite materials of different opacities. Some of the techniques are rather complex, using numerous shades and layers, making them difficult to learn and use in daily practice.

In this article, a simple and predictable restorative technique will be described that concentrates



Fig. 3



Fig. 4





on the recreation of dental tissues of natural thickness, layer by layer. We believe that special attention has to be paid to restoring the enamel layer. The image below, with a cross-section of a natural incisor, demonstrates why it is so important to concentrate on recreation of this outermost layer (Figs. 1 & 2).

If you prepare the tooth with wide bevels on the labial and palatal surfaces (black imaginary preparation line) around two thirds of the restoration volume would be constituted of enamel. Enamel determines the value of the dental shade, being lighter (higher value) or darker (lower value), while the dentine determines the hue and chroma of the dental shade. Enamel becomes darker as individuals age, so it is necessary to have several translucent composite shades that can mimic the ageing enamel.

For a natural-looking anterior restoration, the most important step is the recreation of the enamel and therefore we recommend that you start by determining the value. The entire clinical procedure for this restorative technique is described step by step in the following example. Suppose the tooth #21 exhibits an inaesthetic restoration of the incisal edge, which would be replaced as follows:

**\_Step 1**

When determining the value, decreasing the ambient lighting in the operatory room is advised in order to concentrate on the incisal edge and middle part of the neighbouring tooth, where the enamel is thick, allowing you to determine its colour (Fig. 3).

**\_Step 2**

The hue and the chroma are determined from the cervical area of the crown, where the enamel is thin and the colour of the dentine shines through (Fig. 4).

**\_Step 3**

The old restoration is removed and a wide bevel preparation has been made on the labial and palatal surfaces (flame shaped burs) (Figs. 5 & 6).



**\_Step 4**

A rubber dam and transparent matrix strips are placed (Fig. 7).

**\_Step 5**

Firstly, the palatal layer of a translucent composite material, G-aenial IE (GC), can be positioned by means of a silicon index or by bending the transparent matrix band strips and sculpting the palatal

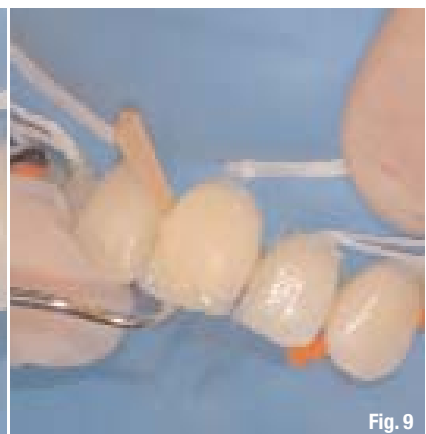




Fig. 10



Fig. 11



Fig. 12



Fig. 13

surface by hand. In order to hide the transition line between the tooth and the translucent composite material, a thin band of the opaque G-ænial in special shade A02 is applied inside. This layer should not be extended too far to the end of the incisal edge or the gingival preparation line to avoid the opaque material shining through (Fig. 8).

### \_Step 6

The rest of the dentine layers and mamelon structure are created with G-ænial in shade A2. This layer should also be thin and even more thinned out in the area of the incisal edge, so as not to block the natural translucency (Fig. 9).

### \_Step 7

On top of this, a thin layer of very translucent G-ænial TE extending to the end of the incisal edge is placed to mimic the sclerotic dentine layer (Fig. 10). This layer helps to create a depth effect and therefore the incisal edge looks more natural. Note that, at this stage, sufficient space has been left for the thick outermost translucent layer.

### \_Step 8

The outermost translucent layer is created in the same external special shade used to form the first palatal layer, G-ænial IE (Fig. 11).

### \_Step 9

The restoration is polished with diamond and Sof-Lex discs (3M ESPE) to recreate the natural

surface morphology of the tooth. The final gloss was achieved by means of a Gradia Diapolisher (GC). The final image of the restoration reveals good translucency and a lifelike incisal edge (Figs. 12 & 13).

### \_Conclusion

This technique uses only four or five different layers of a composite material in three or four opacities, and yields a predictable result. For this reason, it can be used in daily practice for every Class IV or broken incisal edge restoration.

The composite material blends with the natural tooth structure so well that the preparation line is invisible and the restorations are well integrated. The extent of the

anatomical layering depends on the class and size of the lesion. With small Class III and Class V restorations, it is easier to achieve good aesthetics with one or two layers of the composite material. However, with large Class IV restorations, use of this technique should be routine, along with a composite material featuring a wide range of translucent shades, natural opalescence and fluorescence to recreate a natural appearance.

### \_about the author

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**Dr Valdas Vilkinis** was born in 1965 in Kaunas, Lithuania. He obtained his dentistry degree at the Kaunas University of Medicine in 1991. After graduating, he served as a clinical instructor at the Faculty of Dentistry at the

Kaunas University of Medicine until 2000. From 1993 to 1994, he undertook a postgraduate course on cariology, preventive and operative dentistry, and endodontics at the Royal Dental College of Aarhus at Aarhus University in Denmark. He defended his doctoral thesis in 2000.

He has worked in private practice in Kaunas since 1999. Dr Vilkinis has served on the editorial board of the *Journal of Oral and Maxillofacial Research* since 2010. He has held a consultancy agreement with GC Europe since 2000. He also lectures and offers hands-on courses on restorative techniques in Lithuania, Latvia, Estonia and Finland.

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# Un-cosmetic dentistry

Are you ready to reduce your dependence on porcelain restorations?

Author\_Dr Michael Zuk, Canada

While there are some occasional references to concern about the overuse of porcelain, many articles in dental trade publications show off before and after dental makeovers that from my perspective were quite satisfactory prior to expensive intervention. I will not argue that there are people who truly have displeasing smiles and they can benefit greatly from cosmetic dentistry, but all too often people with body-image issues related to a distorted perception of their teeth seem to be easy victims.

"Smilorexia" is the fanciful term I coined for this disorder, which appears to affect attractive young women more than others. If you open the pages of any journal published by the American Association of Cosmetic Dentistry, you will no doubt find at least one or two of these patients having extensive veneer treatment that could easily have been avoided with unbiased professional advice. The problem is that too many dentists have dedicated their lives to pure cosmetic dentistry, which is often based on using porcelain as a cure-all.

**“It is time to adopt a significant change in philosophy...”**

Sadly, many of the cosmetic dentists recognised as the top tier appear to use their standing as a licence to drill. It is time to adopt a significant change in philosophy if the dental profession wishes to maintain any level of integrity. Lip service to con-

servative cosmetic dentistry means nothing. To truly practise "un-cosmetic dentistry", a dentist must back away from ceramics and make use of composite to restore worn edges in combination with orthodontics to correct alignment.

This style of treatment does not have to be unprofitable. It does not have to be only for the simplest of cases either; actually, very complex cases can be treated to a high standard when multiple disciplines are employed together. The collaboration of specialists can be one alternative, but for patients on a budget or in areas with lower access, a general dentist trained in advanced therapies can offer comparable results for a fraction of the fee.

## Biggest bang for the buck— The STO combo

Let's cut to the chase: if you are a general dentist and want to knock your practice out of the park with new opportunities, look at venturing into the realm of advanced shorter-term braces. I specifically say "shorter" because your goal needs to be always trying to be faster because people hate being in braces, and aligners are often too slow or they do not give the dentist enough control of tooth movement.

There are a number of dentists who promote STO, but I developed my own system before I had heard of any others so I have some different ideas. Frankly, levelling and aligning simple orthodontic cases is easy and can be learned through just a short course,

which these dentists (Drs Swain, Barr or De Paul) appear to teach very well. I would rather remain on the fringe of even these trend-setters, and offer my twisted perspective with less corporate influence.

As hugely popular as these STO courses are, there is however some potential for abuse by dentists who simply have a weekend course and no other training in orthodontics. While I would rather see a dentist do more orthodontics than veneering, orthodontists are partially justified for their concerns about GP orthodontics.

Taking courses alongside orthodontists and reading their journals, it is apparent that there is negative sentiment directed towards general practitioners who dare to bracket teeth. I do feel that a united profession is a favourable concept but, having experienced extreme levels of sabotage in my local area, I now refer less than in the past. Some other general dentists have mentioned similar problems (on online forums) with turf protection that appears oddly focused on orthodontics.

An article recently used the term "soft science" to describe orthodontics, and I would certainly agree that it is difficult to claim that orthodontists know the "right way to straighten teeth", since few of them agree on anything. The reality is that the schools of thought in orthodontics are as polarised as the holy war between the myo-centric doctors and the centric relation believers.

grow after all, and patients may be holding their jaw forward in a Sunday bite simply to get their uncomfortable braces off.

## “I know, NOT ALL cosmetic dentists are Veneer Nazis, ...”

Orthognathic surgery may be vastly under-utilised in some cases and overused in others. The use of TADs appears to offer some promise, and while an oral surgeon may find it a nuisance to bother with placing them, a general dentist may be able to get them in place with little difficulty. Orthodontists often tremble at the thought of using a needle (like I did in dental school), so the price goes up as the patient heads to the oral surgeon.

**BIAS:** *A particular tendency or inclination, especially one that prevents unprejudiced consideration of a question; prejudice*

So this article is obviously biased towards expanded skills for the general dentist, but I do respect the need to pick your battles in treatment and refer when the case demands it. I essentially do not believe in putting up with any rubbish from specialists who want to dictate what a general dentist can and cannot do. If you do not like my ideas, tough luck because the ones you have may not stand up under close scrutiny. I do not want to waste my time jus-



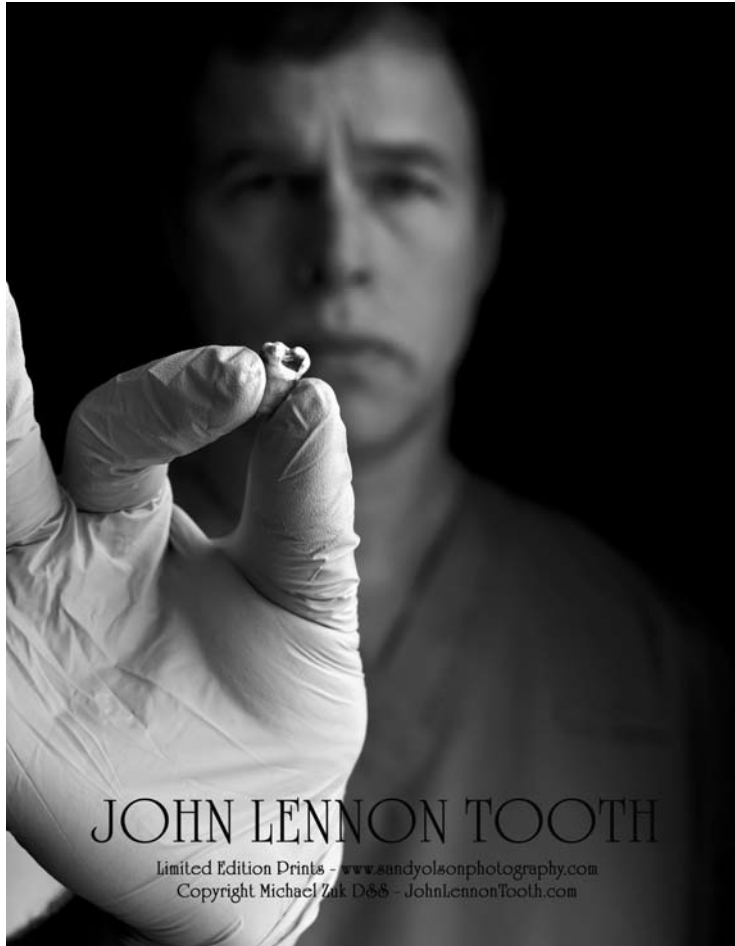
As an example, the use of the Herbst appliance forces the TMJ forward, in an attempt to correct a deficient mandible. This is like someone standing on the balls of her feet to be taller. While the practice appears to be commonplace, there are orthodontists who would never use this technique on their own children or grandchildren. The studies always seem to conclude with a recommendation for long-term data, but the device has been used for 100 years already. Mandibles are not stimulated to

tifying anything I choose to do and if I am taking a course beside an orthodontist who is snivelling that he will start doing fillings and extractions, that is awesome; I may have an opening for an associate.

As excited as I am about STO, I think a two-day course is only a taste of what you need to know. It is like taking a two-day self-defence class and then thinking you can enter mixed martial arts. The problem is not what you learn, but the cases that you attempt

Anterior alignment is completed in extremely short periods of time, as in this example the lateral incisor was proclined in only 3 1/2 months. (DTI/Photos M. Zuk, Canada)

that are actually much more complex than you realise (you will be defeated!). You MUST take a full orthodontic course such as the one taught by Dr Richard Litt, and you are insane not to take a series of oral rehabilitation courses from Dr Frank Spear or Dr John Koiss.



Dr Zuk is also known as the crazy dentist who bought a tooth from John Lennon. (DTI/Photo courtesy of Sandra Olson, Canada)

Adult orthodontics is full-mouth reconstruction, and the treatment of worn dentition is too important to overlook. In fact, orthodontists have a very difficult time trying to treat adults with worn dentition, so I consider this a very good niche for doctors ready to invest in cross-training.

I have seen an orthodontist try to treat an advanced wear situation with full orthodontics, and the result was all wrong. Instead of allowing for the restorative material, the practitioner moved the short teeth into place as if they were full size, so when we wanted to lengthen the worn incisors the result was a posterior open bite. The easier way to treat the case would have been to build up the teeth with composite prior to starting the orthodontics.

Cosmetic dentists have a tendency to veneer everything. They veneer teeth straight because they claim braces take three to four years. They veneer teeth to get rid of wrinkles and headaches. They

veneer teeth to whiten and straighten them. They veneer teeth because the old veneers break. Exaggerated times in braces are often lies that need to be corrected as soon as possible to stop the abuse that is going on. Cosmetic dentists need to reprogramme to back off and get some air. And orthodontists need to give a little elbow room to their referring dentists who want to offer some orthodontics. The smart ones maintain a positive relationship and often see referrals from the primary care dentist increase. I know, NOT ALL cosmetic dentists are Veneer Nazis, and NOT ALL orthodontists tell patients that GP orthodontics causes root resorption.

My suggestion for breaking an aesthetic obsession is "cosmetic detox", which is very difficult if you have focused your training on aesthetic dentistry. The easiest way to do this is to take porcelain veneers off the table in the treatment planning stage. Composite resin can be used conservatively with orthodontics to provide a near-complete medium to long-term solution.

Any time you stick to a single series of training programmes, you start to pick up biases that warp your thinking. You will find that the ideas within the dental profession are as extreme as the religions and political beliefs around the world. The proponents of the various philosophies can be very convincing, but I think each doctor needs to take a step back and make up an individual philosophy that puts the patient first.

If you take the average patient, this means that you will offer fast, affordable, reversible and conservative treatment. Millions has been spent to make people think veneers are better than real teeth; I challenge that idea. Porcelain is not as good as healthy enamel, not now and not ever. Of course, it is a material that serves a purpose but often it is used simply to line the dentist's pockets.

So to recap this approach to care, I suggest you take an STO course from one of the two 6-month braces programmes, add a full orthodontic programme (ideally taught by an orthodontist who has taught orthodontics grad students), take a full-mouth reconstruction programme (or at least a worn dentition component), then if you want you can take a composite technique course.

I personally do not get fancy with composite, since my patients do not have loupes or want to pay double for advanced microscopic cosmetics. What patients do hate is composites that chip/stain. This brings me to use Clearfil AP-X PLT (Kuraray—no endorsement money yet!). Free-hand composite bonding is the best way to be able follow the



contours of the teeth, so scrap the idea of using a wax-up as an instant makeover if orthodontics would be helpful.

The Clearfil shade XL appears to have a chameleon effect that works for most shades of teeth. If a lighter shade is desired, then a cut-back technique can be employed to modify the final appearance with another shade/material like 3M Supreme (3M ESPE).

From my review of the CRA/Clinicians Report literature, this brand of composite is particularly strong in clinical use, and I have heavily restored cases that are still holding up after five years of service. The composite does not polish very well, so I have started using G-Coat as a final glaze, especially for smokers. I simply tell the patient that if he breaks the fillings, there is a 50 per cent warranty for the first 12 months, regardless of how they were broken.

With orthodontic treatment, you should, as mentioned earlier, try to rebuild any worn teeth before starting braces. Since you will be able to move teeth in three dimensions, you simply build up the teeth to full size and then you move directly into orthodontic records to get started. The occlusion should be left "high" and finalised with the braces.

The change in vertical dimension (VDO) appears to be another handicap that paralyses some dentists. If the patient does not have muscular problems and headaches, there may be no need to move into splint therapy to test a bite change. Simply by looking at the effect enamel replacement would have on the bite and considering how orthodontics could manage the result may be sufficient without an articulator. A less deep overbite and a less trapped mandible appear to be desirable within most schools of training.

The cosmetic training really will begin to come into play with incisal displays, tooth proportions and fuller arches. The arch form after orthodontics usually is very pleasing and mimics the technique of overlaying ceramic on the facial surfaces of the upper bicuspids. The term for this has faded from my memory because I tend to avoid courses that push the use of porcelain.

When I attended the UCLA Aesthetic Continuum, Dr Jimmy Eubank took a few moments to talk about a case in which a young teen had had her teeth disfigured with bulky veneers. He was forced to retreat her teeth but she had been compromised for life. As dentists, we are subject to many sales presentations disguised as courses and we rarely get the truth. The truth is dentistry is not easy and taking

one weekend course will not be nearly enough. No guru is going to tell you all that you need to know.

At a recent course on anterior aesthetics taught by Dr Gerald Chiche at the Seattle Study Club, I was forced to prepare a number of veneers on plastic teeth. The burning smell reminded me of dental school, which brought back mixed emotions. I took away the idea of additive cosmetic strategies and the use of minimal reduction if choosing to use ceramic. Bonding to enamel instead of dentine still seems to be the better plan. (I also gave Dr Chiche a few photographs of John Lennon's decayed molar and he shared the fact that he had an original photo of the Beatle that was lost in Katrina—I hope he finds the copy sometime soon!)

**“...the market is shifting towards dentists who are ready to mix up their training.”**

As one of the first dentists to combine STO concepts with advanced treatment planning of the worn dentition, I can honestly say that if you can set aside the use of porcelain veneers and substitute some of the treatment modalities mentioned in this article, you will eventually find a way back to ceramic usage with a better empathy for patient care. The public is becoming wiser and the market is shifting towards dentists who are ready to mix up their training.

As my UK dentist colleague Dr Martin Kelleher, who lectures on "venerial" disease, would say, use the daughter test before you do anything irreversible.

I would add that you owe it to your patients to learn from the best in the profession, and cross-training in continuing education may be the best investment you can make in dental practice.

#### \_about the author

cosmetic  
dentistry



**Dr Michael Zuk** is the author of the book *Confessions of a Former Cosmetic Dentist*. As a consultant to several marketing programmes, including HighSpeed Braces.org and KillerToothache.com, the dentist has cultivated unique niches as alternatives to the veneer-based practice model. He can be contacted at [drz@bowerdental.com](mailto:drz@bowerdental.com).

# Daktari for Maasai – First dental project at Ololosokwan clinic

**Authors** Prof. Martin Jörgens & Dr Caroline Kentsch, Germany



**The whole project arose from my first visit** to Tanzania in October 2010. After climbing the highest mountains in Tanzania—Mt. Meru and Kilimanjaro—I went on a safari mainly visiting the &Beyond lodges of Lake Manyara Tree Lodge, Klein's Camp and Ngorongoro Crater Lodge and the associated national parks.

At all of these places, I was immediately confronted with the massive need for dental care for the staff and local people. Many questions regarding and serious demands for dental aid arose and I became increasingly concerned about the lack of dental care in these regions.

The pivotal moment was unexpected, as always. At Klein's Camp, the Maasai ranger Selay mentioned that there was a small clinic, donated

by Klein's Camp and &Beyond to the local village, close to the village of Ololosokwan. This immediately grabbed my attention and about two hours later I was standing in this small clinic— still much affected by the beautiful surroundings of the Maasai village. The clinic itself had seven rooms. At the time, only three were used daily.

A sign reading "Daktari" on the door of room #4 showed me where to start our dental project in Tanzania. The place in Africa that we had had in mind for years had been found.

The logistical position of the Ololosokwan clinic is perfect: easy to reach because of its proximity to the Ololosokwan road between Klein's Camp and Wasso, and in a safe area regarding flooding and other weather conditions. The clinic





nary medical work at the clinic, he made this place even more valuable for our project. The Ololosokwan clinic offered us an important and solid base for our project, with the local support of Klein's Camp in terms of accommodation and transport.

We even established a good relationship with the local head medical officer of the Serengeti, Dr Bakari Salum. He agreed to support our project and requested an appointment at his governmental office in Wasso during our expected first stay in Ololosokwan between 23 December 2011 and 2 January 2012.

It took us more than one year to return to the Ololosokwan clinic. The preparations had taken us longer than expected because of the new hygienic standards we had had to implement in our clinic in Germany the previous summer.

Preparations before the trip to Tanzania were focused on three major material groups:

- dental equipment and instruments, which we bought at action medeor Germany to give as a donation to the Ololosokwan clinic;
- medicines, which we bought from medeor Tanzania and from Tanzania Pharmaceutical Industries in Arusha, also as a donation for the Ololosokwan clinic; and
- all the dental and medical equipment—all specialist equipment for mobile dental treatment—from our clinic, which we took to Tanzania and back.

The major equipment included the mobile Trans'care Max dental unit (Acteon), the mobile Mini LED light (Acteon), the mobile DX3000 X-ray

itself is a soundly constructed, modern building with solid cemented foundations and a solid roof. Some preparation has even been done for water and electricity supply. Obtaining a permanent water supply and electricity using generators is one of the goals for its future development. Behind the clinic, there are some small buildings for staff, doctors and nurses that can be used in future as well.

Yet another advantage of the Ololosokwan clinic is that there is a clinic doctor. Dr Obed Lasseroi was engaged by &tBeyond, thereby securing constant medical supervision of the village and the clinic in the future. Owing to his very kind character, his competency in English and all the local languages, and his interest in the development of other medical offerings for interdisciplinary





(Dexcowin) and the portable Claros PICO diode laser (elexxion). We took along a huge number of surgical instruments, periodontal instruments, many different types of disinfectants for different types of wounds, a range of filling materials and endodontic materials, and so on.

Condor, the German aircraft carrier, very kindly supported the special flight to Tanzania and back to Germany.

After our arrival at Kilimanjaro Airport, we passed through customs and the load was lifted into a special Toyota Land Cruiser from Tawanda Munengiwa, the General Manager at Klein's Camp, equipped with well-maintained safari equipment and a lot of extra space for our dental boxes.

We then travelled to Arusha, where we obtained the medicines from Tanzania Pharmaceutical Industries and bought some more disinfectants in town. After this, we started the first leg to Lake Manyara Tree Lodge. Here, we were asked to check some staff after breakfast. From just two, nearly 15 people with dental problems had arrived within ten minutes. So we decided to stay for one more day to treat them all.

The site for our first dental adventure was the old medical room close to the staff accommodation. We thought that one of the advantages

of this location was that it was far from the guest areas. This was always an important aspect for us at all &Beyond locations: no disturbing of the guests. Being visible and explaining the medical/dental background of the project was necessary and important in terms of raising awareness, but the treatments were always performed in separate areas for the privacy of both the guests and the patients.

At Lake Manyara Tree Lodge, we mainly performed extractions and minor oral surgery, and thereafter periodontal treatments and fillings were done. In this manner, we worked the whole day, operating and restoring teeth until the evening. In total, we treated more than 20 people in one day.

The day after, we left Lake Manyara and did the long, hard drive through the Serengeti, arriving at Klein's Camp after 7 p.m.

The next day, we went to the Ololosokwan clinic for the first time. We met Obed and presented the medicines and dental equipment to him for the clinic, and prepared one room for the dental work for the following days.

We spent one more day at Klein's because it was important for us to treat all the local staff too. We were given use of the terrace of the second house for the day, where we would have enough





space for our equipment. The equipment was set up early in the morning. There were many different cases. One young massage therapist even received two endodontic treatments of her upper premolars instead of the standard extractions. She was naturally most pleased not to have her teeth pulled. This alternative treatment saved her two premolars and her job working in this guest-sensitive area. We performed many extractions, periodontal treatments and dental surgery, as well as removal of defective fillings and decay.

The first operation day at the Ololosokwan clinic was a clear indication of the days to follow. Every day, a massive number of Maasai arrived for dental treatment. Obed was very gentle and helpful, not only because of his support but also because of his translation skills and his communication skills with the Maasai. He proved his competence daily and we were all very satisfied every evening.

We had obtained a translation guide for Swahili that we had arranged from home before our arrival. This was very useful in some situations because we soon decided to work simultaneously on two different chairs in room #4 owing to the high number of patients and the high number of treatments required by even a single patient. This was even harder work but less time-consuming than the standard one-chair treatment.

In total, we treated more than 220 Maasai people at the Ololosokwan clinic over the period. We used all of the dental equipment daily: the Trans'care Max, the elnexion pico laser, the Dex-cowin mobile X-ray and the Acteon Mini LED. The majority of the treatments were extractions of decayed wisdom teeth, extractions of infected molars, removal of old decayed roots and infected tissue, fillings of minor cavities, removal of tartar, some periodontal treatments, soft laser treatments after surgery or because of infections,

some occlusal corrections if malocclusion was evident, correction of functional disorders, guided extraction of decayed primary teeth, orthodontic treatment and a great deal of medical explanations regarding prophylactic aspects.

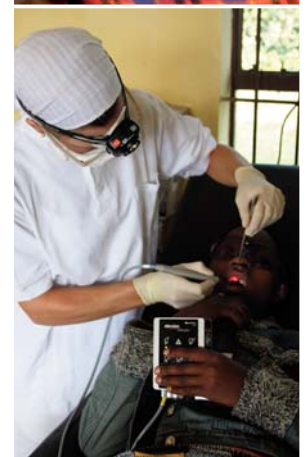
Some extractions were done for the Maasai for traditional reasons. This was difficult for us in the beginning, but Obed's explanation soon led us to understand that this was 100 times better than leaving the poor patient to deal with his tooth, knowing that tradition would lead him to extract his tooth using a knife or other non-dental instrument without anaesthetic.

Every evening, we returned to Klein's very tired but always motivated for the next day.

After completing our treatment at the clinic, we again set up the mobile clinic at Klein's for our last working day—this time in a spacious and comfortable tent that was usually used in the tented camps. Again, we prepared two separate treatment areas and did all kinds of dental treatments. We were able to treat all of the patients at Klein's comprehensively. Even the 20 Maasai who had travelled by off-road vehicle to Klein's on that day were all given complete treatment on this last day. At this point, we were forced to finish because we had run out of local anaesthetic and gloves.

On the last day at Klein's, we prepared our instruments and packed all of our equipment again for the long, tough drive through the Serengeti and for the flight back to Germany.

We were 100 percent satisfied with the treatments that we had given mainly to the population of Ololosokwan and the staff of the EtBeyond lodges. All of our donated equipment and our own equipment had been perfectly set up and fulfilled all the requirements for the treatments needed.







and safer—not only in daylight but also especially for night-time emergencies. A clean water supply is also a must for a clinic and for a dental department too, and for other medical disciplines like gynaecology, ophthalmology and surgery.

From our side, our hearts are beating for Ololosokwan and we are willing to support this place as much as we can in future. Ololosokwan could become a local centre for interdisciplinary treatment by a group of doctors from various medical fields.

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Our experiences at the time have already led to the preparations for our next visit. So far, we aim:

- \_to offer a constantly increasing dental service at the Ololosokwan clinic and Klein's Camp;
- \_to bring two new mobile dental chairs for simultaneous operations upon our next visit;
- \_then to add two operating lights and two separate suction units;
- \_to bring one separate mobile ultrasonic kit to be used for perio by a dental hygienist; and
- \_to extend the number of surgical instruments.

Besides these dental arrangements, two major necessities for the development of the clinic need to be arranged by the local community, maybe in collaboration with Klein's Camp: electricity and water supply. Electricity is a must for the future. Of course, we could always borrow a generator, but a fixed and powerful one, protected in an outbuilding and with permanent wiring to all seven rooms, would make the clinic in terms of medical standards much more reliable, comfortable, normal

**\_about the authors** **cosmetic dentistry**

**Prof. Martin Jörgens** graduated from the Westfaelische Wilhelms University Muenster (Germany) in 1989. He is a President of DGKZ (German Association of Cosmetic Dentistry) and professor for laser medicine at the University of Sevilla (Spain). He holds a private dental office "DentalSpecialists" together with Dr Caroline Kentsch and Prof. Marcel Wainwright.

**Dr Caroline Kentsch** is specialised in Periodontics, Veneers and Full Ceramic Reconstructions.

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# CLEARFIL DC CORE PLUS KIT: Stressless and reliable

Today dentists are looking for a core build-up material that offers not only reliability and good performance but also ease of use. Such core material has to be aimed at high-quality and long-lasting restoration. Therefore, at the beginning of 2012, Kuraray introduced its new core build-up material, CLEARFIL DC CORE PLUS KIT. This material meets all the demands of today's dental practice.

CLEARFIL DC CORE PLUS is a dual-cure (light curing with self-curing property), two-component core build-up material supplied in an automix delivery system for aesthetic and reliable restoration. The self-curing property of this new core material is the perfect solution for those areas of the root canal that cannot be accessed for light curing. For all other areas, curing time can be reduced by light curing.

For core build-up restorations, it is essential to reduce the risk of contamination using a short and easy application procedure. CLEARFIL DC CORE PLUS is designed for stressless restoration, thanks to its simplified procedure and optimal paste handling. Only one mixing tip is needed for all steps, from application in the root canal to the core build-up, resulting in a working time of three minutes. Furthermore, the self-etching technology offers effective and reliable adhesion to dentine without damaging the dentine. Owing to its outstanding self-etching adhesive properties, CLEARFIL S3 BOND PLUS is the perfect complement to CLEARFIL DC CORE PLUS, which enables excellent long-term clinical performance.

CLEARFIL DC CORE PLUS is yet further proof of Kuraray's outstanding competence in dental materials and its extensive scientific experience. As science and society continue to develop, new questions and challenges also arise for dental materials. Kuraray has been at the forefront of such advancement for over 30 years. Through an intensive and regular exchange of information with its customers, comprehensive research and development, and ongoing training, Kuraray ensures that dentists will always have a reliable partner in the company, which offers attractive solutions for a new era of protective filling therapy.

## About Kuraray Europe GmbH

Established in Kurashiki, Japan, in 1926, Kuraray Co. Ltd has a broad knowledge and experience base

in polymer chemistry, chemical synthesis and chemical engineering. Starting with the industrial production of synthetic fibres from viscose, Kuraray soon extended its pioneering technologies and expertise to many more fields of business such as the dental industry, continuously providing effective solutions with a high level of service and a focus on the customer.



In 1978, five years after entering the field of dental materials, Kuraray paved the way for adhesive dentistry with the introduction of the first bonding system, CLEARFIL BOND SYSTEM F. At the same time, the company developed the total-etch technique for enamel and dentine, which marked the beginning of minimally invasive dentistry. Today, Kuraray continues to steadily produce innovative quality products that meet the requirements of a profession that too is developing constantly. Its products that have made history—PANAVIA F2.0, CLEARFIL PROTECT BOND, CLEARFIL SE BOND, CLEARFIL AP-X and ESTENIA C&B—are proof of Kuraray's capability in developing solutions for practice through its pioneering research.

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# International Events

## 2012

### **BSAD International Meeting**

19–22 September 2012  
São Paulo, Brazil

### **SCAD Annual Conference**

28 & 29 September 2012  
Chicago, USA  
[www.scadent.org](http://www.scadent.org)

### **1<sup>st</sup> ASIA-PACIFIC EDITION 7<sup>th</sup> CAD/CAM & Computerized Dentistry International Conference**

6 & 7 October 2012  
Singapore, Singapore  
[www.cappmea.com](http://www.cappmea.com)

### **Dental-Facial Cosmetic International Conference**

9 & 10 November 2012  
Dubai, UAE  
[www.cappmea.com](http://www.cappmea.com)

### **BACD Annual Conference**

22–24 November 2012  
Manchester, UK  
[www.bacd.com](http://www.bacd.com)

### **AIOP International Congress**

22–24 November 2012  
Bologna, Italy  
[www.aiop.com](http://www.aiop.com)

### **Greater New York Dental Meeting**

23–28 November 2012  
New York, USA  
[www.gndm.com](http://www.gndm.com)

## 2013

### **International Dental Show**

12–16 March 2013  
Cologne, Germany  
[www.ids-cologne.de](http://www.ids-cologne.de)

### **AACD Annual Meeting**

24–27 April 2013  
Seattle, USA  
[www.aacd.com](http://www.aacd.com)

### **EAED Spring Meeting**

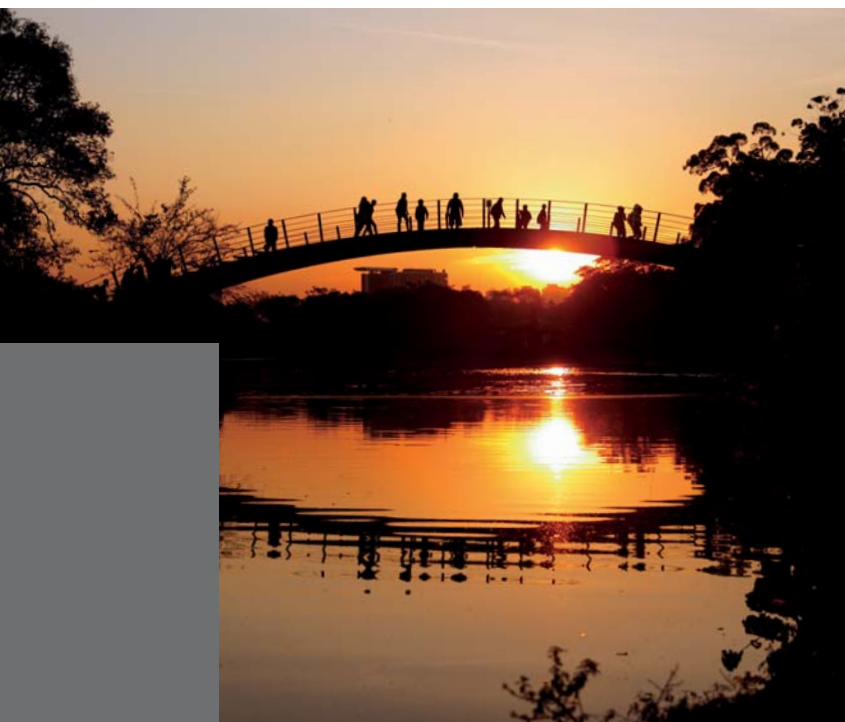
30 May–1 June 2013  
Crete, Greece  
[www.eaed.org](http://www.eaed.org)

### **AAED Annual Meeting**

7–10 August 2013  
Washington, USA  
[www.estheticacademy.org](http://www.estheticacademy.org)

### **FDI Annual World Dental Congress**

28–31 August 2013  
Istanbul, Turkey  
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- \_ 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.).

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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.

In short, we do not want to limit you in terms of article length, so please use the word count above as a general guideline and if you have specific questions, please do not hesitate to contact us.

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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.

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