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Smile aesthetics and occlusion: A controversial topic in dentistry

Dr Sushil Koirala
Editor-in-Chief

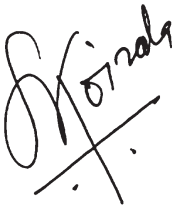
_Cosmetic dentists around the world routinely perform various diagnostic and therapeutic procedures that involve occlusion (fillings, crowns, bridges, removable prostheses, implant-supported restorations, full mouth rehabilitation and orthodontics). Aesthetics is related to human perception, desires and personality, and is basically guided by social trends, while occlusion is related to forces and entails the relation between the maxillary and mandibular teeth when they are in contact and the masticatory system's response to the forces generated by the new position of the teeth. Smile aesthetics and occlusion has been, and is still to some extent, controversial, as there are numerous questions related to smile and occlusion that have not been answered with scientific certainty and there are many diverse and polarised opinions regarding this.

In their undergraduate education, dental students are not fully trained in the science and art of both smile aesthetics and occlusion. When these new graduates enter into clinical practice and begin undertaking complex clinical cases, many become confused with the numerous theoretical recommendations and varied concepts about cosmetic dentistry and occlusion in academic and clinical dentistry. In order to understand the core relationship between smile aesthetics (macro, mini and micro) and occlusion (masticatory force management), a clinician must be familiar with the pros and cons of all the popular concepts and theories regarding smile aesthetics and occlusion, and based on this select the most conservative treatment that is best suited to the patient and that will ensure health and function.

With this in mind, two global educational academies, namely Minimally Invasive Cosmetic Dentistry (www.micdglobalacademy.com), or MiCD, and Teeth, Muscles, Joints and Airway Harmony (www.tmjaharmony.com), or TMJA, have been established with the aim of promoting healthy, comprehensive dentistry by disseminating the relevant knowledge and information regarding various concepts, theories and clinical protocols concerning smile aesthetics and occlusion.

I am pleased to mention here that recently the Faculty of Dentistry of Thammasat University in Thailand and the Vedic Institute of Smile Aesthetics in Nepal, along with three supporting partners (SHOFU Dental Asia-Pacific in Singapore, Tekscan in the USA, and Bio-Research Associates in the USA), signed a memorandum of understanding to establish the MiCD and TMJA Harmony International Training and Treatment Center at the Faculty of Dentistry of Thammasat University. This centre will coordinate with various like-minded clinicians, academics and researchers working in the field of cosmetic dentistry and offer structured, skill-based training in MiCD and TMJA harmony dentistry especially for dentists in the Asia Pacific region.

In this year's third issue of cosmetic **dentistry**, we have included various clinical articles, from simple cosmetic restorations to complicated implant treatment. I hope you will enjoy reading this issue.



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page 06


page 20


page 24

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page 28

page 36


page 38

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Minimally Invasive Cosmetic Dentistry

Same-day inlay/onlays strive to save the tooth

Authors_ Drs Lorin Berland & Sarah Kong, USA

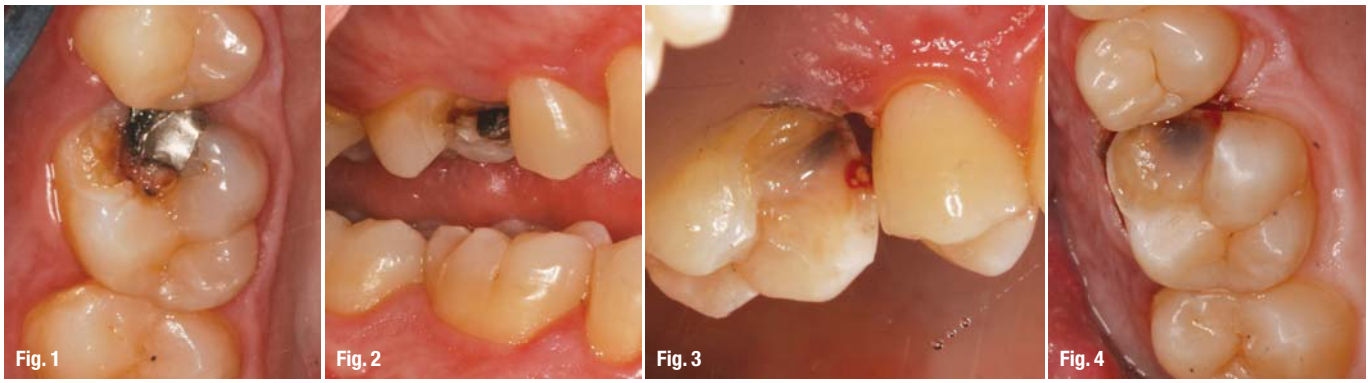


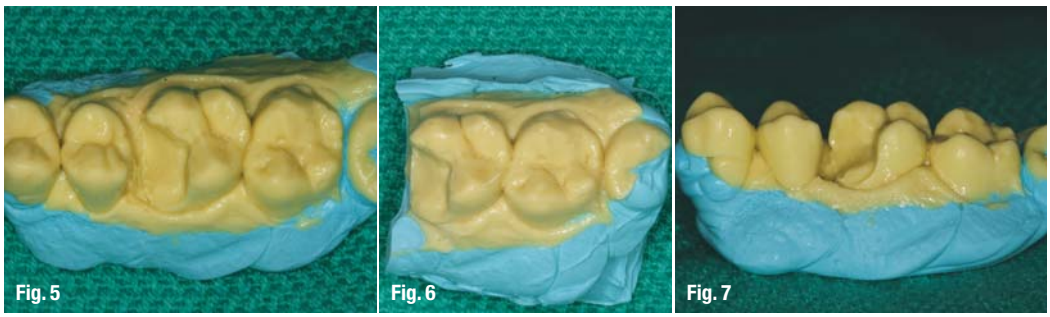
Fig. 1_#3 pre-op, palatal view. (Photos/Provided by Dr. Lorin Berland and Dr. Sarah Kong)
Fig. 2_ #3 pre-op, buccal view.
Fig. 3_Decay removed and lining placed.
Fig. 4_Prepped tooth, palatal view.

_The name of the game in dentistry today is to save the tooth for use in the future. In this age of adhesive dentistry, respecting and preserving the remaining healthy tooth structure as well as improving aesthetics have become components of value as well. With today's advanced technology and materials, longevity is mainly a matter of diagnosis, correct treatment planning and proper execution of technique.

The problem with replacing old amalgams with tooth-coloured composites is that they are difficult, inconsistent and unpredictable. Yet, the warranty on these 30-, 40- and 50-year-old silver fillings is running out. We have to remember that amalgam technology is more than 150 years old. At that time, people lost their teeth a lot earlier and died a lot earlier, too.

Now, however, we have a population that is over 50 years old and growing—and they want to keep their teeth feeling good and looking good. Patients are now living longer and they want and expect to keep their teeth for a lifetime.

Adhesive dentistry offers a more conservative restorative approach to conventional dentistry. Why take away healthy tooth structure when



there's a viable alternative? Why not attempt to save the good and just replace the bad? Direct composites and laboratory composite resin systems are valuable and worthwhile options to preserve tooth structure and long-term dental health. After all, preserving a patient's natural tooth, whenever possible, is always in his or her best interest.

It has been our experience that providing multiple, large interproximal posterior composites directly can be difficult to achieve on a consistent basis in the oral environment, especially when replacing amalgams. Why? Because they take a lot of chair time. Amalgams require bulk. That's why we were taught the block type preparation to provide the necessary bulk for strength.

Furthermore, because amalgams do not bond, we were taught to create undercuts and "extension for prevention." As mercury contracts and expands with cold and hot temperature changes over time, cracks form in the glasslike nature of teeth.

Most of the time, these large preps are difficult to restore with direct composite. There are isolation and contamination issues, and it is difficult to replicate nature in the mouth in a timely, cost-effective and predictable manner for every case, every time. In addition, curing in layers makes for a long appointment and increases the possibility of contamination. It is uncomfortable for patients to keep their mouths open for the prolonged amount of time necessary.

Often, large direct posterior composite resins yield unsatisfactory results in terms of esthetics, and especially long-term function, due to curing and contamination issues.

However, when we do same day inlay/onlays out of the mouth and in the laboratory, we find that multiple posterior restorations are easier, stronger and more anatomically correct. Because they are processed at the same time, they can be even more time efficient than using a CAD/CAM system and reduce tooth movement during the transitional phase that can result in altered contact or occlusion.

Not having to deal with provisional restorations absolutely eliminates those untimely emergencies when temporaries break or come off. Those costly, non-productive, uncomfortable and unhappy second appointments can also be avoided, saving everyone time and money. In addition, without concerns about retention of temporaries, preparation can be even more conservative.


Fig. 8


Fig. 9


Fig. 10

Fig. 5_Silicone model.
Fig. 6_Sectioned model.
Fig. 7_Silicone model, buccal view.
Fig. 8_Tooth ready to bond.
Fig. 9_Expasyl placed interproximally prior to seat.
Fig. 10_Onlay seated, palatal view.

_Case 1

In this case, the patient came to our office on an emergency basis with a broken tooth on the upper right molar. It was no surprise that the tooth had a previously placed MO amalgam with recurrent decay that caused the mesiobuccal cusp to fracture off completely (Figs. 1 & 2). Often, teeth that have had old amalgam fillings tend to break due to cracks caused by the expansion and contraction of the metal alloy in the tooth's glasslike substance.

In addition, caries detectors were non-existent when the bulk of amalgam restorations were placed so many teeth have recurrent decay under the old amalgam fillings.

After thorough clinical and radiographic examinations were performed, it was determined with the patient's input that a same-day onlay would be the most prudent option for this tooth. This way, he would be receiving the maximum amount of care in the least amount of time.

The procedure

After placing topical anaesthetic, articaine HCl 4 % with 1:1,00,000 epinephrine was ad-

Fig. 11_Onlay seated, buccal view.


Fig. 11

Fig. 12_Tooth #30 pre-op.
Fig. 13_FenderWedge in place.
Fig. 14_Caries detector.
Fig. 15_Prep with liner.

ministered to achieve profound anaesthesia. Next, a nitrous oxide nasal mask was placed to decrease the patient's exposure to mercury aerosol while the amalgam was being removed. In this case, because the patient opted not to use nitrous oxide, pure oxygen was administered through the nasal mask.

We continued by isolating tooth #3 with a rubber dam. This step was essential to reduce the amount of amalgam ingested by the patient. It also offers isolation, higher visibility and better dentistry for our patients. If doing quadrant dentistry, I like to use the split-dam technique, which stretches to include several adjacent teeth in a quadrant. A FenderWedge (Directa) was then placed to separate and protect the adjacent tooth during prep, air abrasion, etching, bonding and refining while continuing to wedge the teeth for a tighter interproximal contact in the final restoration.

To facilitate removal of the remaining amalgam restoration, an hourglass-shaped diamond bur was used as diamonds are less likely to produce the fracture and craze lines associated with carbide burs. High-speed evacuation was used throughout the procedure to help decrease possible inhalation and ingestion during amalgam removal.

"Adhesive dentistry offers a more conservative restorative approach to conventional dentistry. Why take away healthy tooth structure when there's a viable alternative? Why not attempt to save the good and just replace the bad?"

Caries detector was painted onto the prepared surface, and it was noted that cracks associated with the long-time expansion and contraction of the mercury-filled amalgam restoration had contributed to the apparent interproximal decay. Once the decay was carefully and completely excavated using a small, round diamond bur and a spoon excavator, the tooth was insulated in a few important steps (Fig. 3).

First, disinfectant was placed on the prepared dentinal surface (Hemaseal & Cide, Advantage Dental Products) and air-thinned. Then, two coats of self-etching bonding agent (OptiBond All-In-One Unidose, Kerr Dental) were placed to provide reduced postoperative sensitivity and high dentin bond strength.

After air thinning and light curing, a flowable composite (Premise Flowable, Kerr Dental) in the lightest shade was added to the internal walls and floor to create an even floor and to fill in undercuts that were originally prepared for amalgam retention. A flat-end cylinder, fine-grit, short shank diamond was used to refine the tooth preparation after insulation was completed (Fig. 4).

Next, two identical hydrocolloid alginate impressions (Dux Dental) were taken fast and accurately. They take only 90 seconds to set with our chosen materials, so they are ideal for same-day inlay/onlays. Before expressing the hydrocolloid material into the prepped tooth, we squirted a little surfactant (Prep-Wet Plus, Dux Dental) onto the tooth to wet the prep while my assistant mixed the alginate.


Fig. 16


Fig. 17


Fig. 18


Fig. 19

Fig. 16_Identic Hydrocolloid impression.
Fig. 17_Basing the poured impression.
Fig. 18_Silicone model.
Fig. 19_Model with undercuts waxed.

Meanwhile, a second assistant was loading a syringe with warm Identic Syringable Hydrocolloid Cartiloids (Dux Dental) to hand to me. The "plug" was initially squirted away from the prep and then into the prep itself so as not to interfere with a "clean" impression. Once the tray had been loaded with the alginate (Identic, Dux Dental), the first assistant handed it to me. The tray was inserted with gentle pressure and held steady for 90 seconds. Another impression was taken using the same aforementioned steps.

The patient then had about an hour break while the inlay was being made and was able to make the most efficient use of his time by having his teeth cleaned with the hygienist during this break in treatment. This not only made the time seem to go by faster for the patient, but it also eliminated "dead time" in our schedule.

The patient made the most of his time in the chair, fixing his broken tooth and getting his teeth cleaned. This type of combination treatment lends itself to a more productive day when scheduled this way, and patients really appreciate it.

Lab work

Meanwhile, back in the lab, the impressions were first disinfected and then poured with MACH-SLO (Parkell) and based with bite registration material on a C-Bite articulator (C-Bite, Dental Products) (Fig. 5). An electric waxing unit was used to block out any undercuts on the die (Ultra Waxer, Kerr Lab).

The onlay was incrementally built in composite layers with a D2 primary dentin base shade (Premise Indirect Primary Dentin, Kerr Dental) followed by an A2 facial dentin shade (Premise Indirect Facial Dentin, Kerr Dental) and a neutral incisal shade (Premise Indirect Incisal, Kerr Dental).

Once the onlay was cured with light, heat and pressure in the BelleGlass curing unit (Kerr Dental) for 10 minutes, it was fitted, adjusted and polished on the silicone models (Figs. 6 &7) with various burs and polishing wheels. All margins, contacts and contours were easily and accurately verified outside the mouth, saving valuable chair time and clinical frustration.

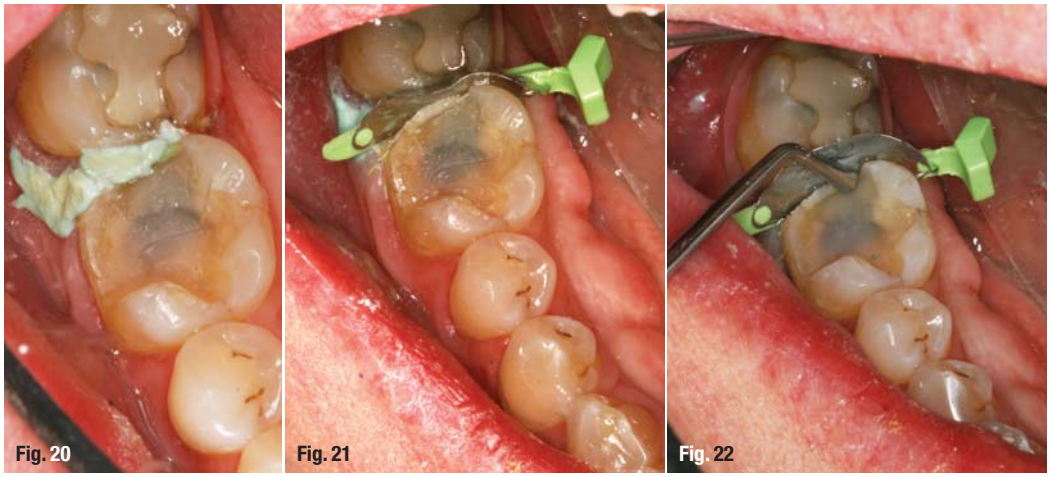
Seating the onlay

When seating the onlay, a medium size Isolite (Isolite Systems) was applied for easy isolation, suction, bite rest and illumination during the cementation of the onlay. No further anaesthesia needed to be administered as the tooth had been lined with flowable composite during the prep stage. Patients really appreciate this—especially because they are almost back to "normal" by the time they leave.

The onlay was then tried in to verify proper contacts, contours, margins and esthetics. Before cementation, Expasyl (Kerr Dental) was gently packed into the sulcus (Fig. 8). The aluminium chloride dried the tissue, reducing the risk of sulcal seepage and contamination. The FenderWedges were then inserted beneath the interproximal floor to slightly separate and isolate the adjacent teeth and to help facilitate seating the onlay.

After rinsing the Expasyl (Kerr Dental) thoroughly, the enamel and composite core were gently micro etched with aluminum oxide (Etch-Master, Groman Dental) to increase retention

Fig. 20_Expasyl prior to seat.
Fig. 21_Expasyl and FenderMate prior to seating.
Fig. 22_Adapting FenderMate.



and remove any debris. Then the enamel and composite core were etched for 15–30 seconds. A single component, fifth-generation adhesive (OptiBond Solo Plus Unidose, Kerr Dental) was applied in two coats and air-thinned until there was no more movement. The enamel should be glossy (Fig. 9). Flowable composite (Premise Flowable, Kerr Dental) was dispensed into the prepped tooth and then the inlay was inserted into the tooth.

The FenderWedges were removed and the onlay was further seated using the Titanium-coated #21 Acorn with gentle pressure. Complete seating was facilitated using the contra-angle packer/condenser while an explorer was helpful in removing excess flowable before curing. When dealing with onlays involving interproximal surfaces, it is a good idea to floss after seating the onlay and before curing. The restoration was cured from all angles, starting at the interproximal gingival floors where leakage is most likely to occur.

Occlusal flash and excess flowable composite were then "buffed" with a short flame carbide while the interproximal margins were adjusted with bullet or needle carbides. Sometimes a Bard Parker #12 scalpel and Qwik Strip (Axis) are used to allow for easier removal of interproximal cement.

Once the proper occlusion was established, a diamond-impregnated point and/or cup was used to polish the restoration. Polishing was further enhanced through the addition of polishing paste.

In just one appointment, an esthetic and conservative interproximal onlay replacing a mesiobuccal cusp was prepped, placed and polished (Figs. 10 & 11).

_Case 2

This patient also came in with a dental emergency. The filling had fallen out of his broken, lower right molar the day before he was going overseas for three weeks on business. He wanted a "quick and permanent solution" (Fig. 12).

First the tooth was anesthetized. Next, a FenderWedge was used to isolate the involved tooth, protect the adjacent interproximal surface and pre-wedge the teeth for optimal contacts (Fig. 13). The Isolite was placed to obtain a dry and illuminated field. We used caries detector to ensure complete decay removal (Fig. 14).

The tooth was then microetched, etched and desensitized with HemaSeal and Cide (Advantage Dental Products). Two layers of self-etching bonding agent (OptiBond All-In-One Unidose, Kerr Dental) were applied to provide reduced postoperative sensitivity and high dentin bond strength. This was then air-thinned and light-cured.

Flowable composite (Premise Flowable, Kerr Dental) was added to the internal walls and floor, creating an even floor and filling in undercuts that were originally prepared for caries removal and amalgam retention (Fig. 15). After the tooth was insulated, the prep was refined with a flat-end cylinder, fine-grit, short shank diamond.

Two Identic hydrocolloid impressions (Dux Dental) were then taken as before. These impressions were handed to the assistant to be poured in the lab (Fig. 16). During the time between the onlay prep and seat, a small filling was done on another tooth to make the most of this appointment time slot while the onlay was being fabricated in the lab.

Lab work

As described in the previous case, the assistant immediately poured the impressions in the lab with MACHSLO (Parkell) after disinfecting them and basing them with a rigid, fast-setting bite registration material such as Blu-Mousse (Parkell) (Fig. 17). Within two minutes, we had a working silicone model on which to build the onlay (Fig. 18). The undercuts were then blocked out with an electric waxer (Ultra Water, Kerr Lab), paying special attention to avoid the margins (Fig. 19).

Starting with the Premise Indirect (Kerr Dental) dentinal shades (A2 primary dentin and A1 facial dentin) and ending with incisal shades (Neutral incisal), the onlay was incrementally fabricated in layers using various composite instruments. The onlay was then placed in the BelleGlass curing oven for heat, pressure and light curing.

In approximately 10 minutes, the onlay was ready to be finished with multiple finishing burs (Fig. 20) on the silicone models. The onlay was polished for a high shine and then checked on the model to verify accurate interproximal contacts and margins (Fig. 21).

Seating the onlay

When seating the onlay, the Isolite was reapplied for isolation, ease of placement and the patient's comfort during the cementation stage. Before cementation, Expasyl (Kerr Dental) was gently packed into the sulcus, creating a dry space between the tooth and tissue without any risk of rupturing the epithelial attachment (Fig. 22). The aluminum chloride in the Expasyl dried the tissue, reducing the risk of sulcal seepage and contamination.

The FenderMate was then inserted beneath the interproximal floor to slightly separate and isolate the adjacent teeth and to help facilitate seating the onlay (Fig. 23). The Expasyl (Kerr Dental) was rinsed off thoroughly and the FenderMate was adapted to the adjacent interproximal surface with a condenser (Fig. 24).

Once all of this was properly placed, the enamel and composite core were first microetched to remove any debris and increase mechanical retention of the surface of the composite flowable liner. Then the surface was further prepared for bonding with 37 % phosphoric acid for 15–20 seconds.


Fig. 23


Fig. 24

Fig. 23_Seating onlay.
Fig. 24_Final onlay.

A single-component, fifth-generation adhesive (OptiBond Solo Plus Unidose, Kerr Dental) was applied in two coats and air-thinned until there was no more movement. No curing was done at this time. Flowable composite (Premise Flowable, Kerr Dental) in the lightest shade was then dispensed into the prepped tooth before inserting the onlay into the tooth.

Before curing, the FenderMate was removed and the onlay was further seated using a condenser with gentle pressure. Complete seating was facilitated using the contra-angle packer/condenser. An explorer was helpful in removing excess flowable before curing. Floss was applied between the involved interproximal surfaces before curing and left in place to remove excess interproximal cement and facilitate the cement removal step after curing.

The restoration was cured from all angles, starting at the interproximal gingival floors where leakage is most likely to occur. Occlusal

"The problem with replacing old amalgams with tooth-coloured composites is that they are difficult, inconsistent and unpredictable. Yet, the warranty on these 30-, 40- and 50-year-old silver fillings is running out. We have to remember that amalgam technology is more than 150 years old."

flash and excess flowable composite was "buffed" with a short flame carbide while the interproximal margins were adjusted with bullet or needle carbides.

A Bard Parker #12 scalpel and Qwik Strip (Axis) were used to remove interproximal cement and then the remaining floss was used to floss out any remaining cement and to ensure proper at-home flossing.

Once the ideal occlusion was established, diamond-impregnated points and/or cups were used to polish the restoration, starting with the coarsest grit first and finishing with the finest grit for a smooth finish while a PDQ composite polishing brush (Axis Dental) with composite polishing paste (Enamelize, Cosmedent) made for a final high shine.

_Conclusion

There are certainly clear advantages for both the patient and the dentist when doing indirect composite resin restorations. These restorations have helped us save patients' teeth, time and money. Over the last 20 years, we have tweaked, updated and modified these restorations in terms of techniques, materials and equipment. These restorations not only save time and conserve healthy tooth structure, they are a valuable service to provide to our patients; and they appreciate it.

Direct composites are an essential part of our armamentarium. Nevertheless, indirect composite restorations have many advantages, especially when dealing with multiple restorations involving adjacent interproximal surfaces. There is simply no comparison between the strength of these materials made outside of the mouth with those cured in the mouth.

Moreover, it is much easier to build, control, polish and finish the occlusal, interproximal and facial/lingual morphology in the laboratory. Patients appreciate the numerous benefits of both direct and indirect composites, and they especially appreciate not having to be in cumbersome temporaries or having an inconvenient second appointment.

Perhaps the greatest advantage for the patient is being able to conserve the maximum amount of healthy structure while saving time and money—all at the same time. "The trend in dentistry today is clearly toward more esthetic and less invasive. Indirect resin and ceramic inlays and onlays are not only compatible with this trend, but fulfill very nicely the restorative void between fillings and crowns," said Ronald D. Jackson, DDS, FAGD, FAACD (*Cosmetic Tribune US Edition*, Vol. 1, Nov. 4, Dec. 2008).

Regarding durability, esthetic inlays and onlays are not new anymore. They have a record of accomplishment, and it is good. Wherever you practice, and however you practice, these restorations are durable, aesthetic, economical and very much appreciated!_

_about the authors

Dr Lorin Berland, a fellow of the AACD, pioneered the dental spa concept in his multi-clinician practice in the Dallas Arts District. His unique approach to dentistry has been featured on television ('20/20') and in national publications and major dental journals, including Time magazine. In 2008, he was honored by the AACD for his contributions to the art and science of cosmetic dentistry. For more information on The Lorin Library Smile Style Guide, www.denturewearers.com and the Biomimetic Same Day Inlay/Onlay 8 AGD Credits CD/ROM, call +1 (214) 999-0110 or visit www.dallasdentalarts.com.

Dr Sarah Kong graduated from Baylor College of Dentistry where she has served on the faculty in the department of restorative dentistry. She was voted a Texas Super Dentist and Texas Best General Dentist for general dentistry by her peers. Kong is part of a unique multispecialty private practice group in Dallas, www.berlanddentalarts.com, where she focuses on preventive, cosmetic, restorative and pediatric care as well as oral appliance therapy for TMJ, snoring and sleep apnea. Kong is an active member in numerous professional organizations, such as the American Academy of Cosmetic Dentistry, American Dental Association, Academy of General Dentistry, Texas Dental Association and Dallas County Dental Society, where she has served on the membership committee and the peer-review board.

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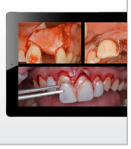

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Dentofacial aesthetic analysis using 3-D software

Synergy between aesthetic dentistry and aesthetic medicine

Author_ Dr Valerio Bini, Italy

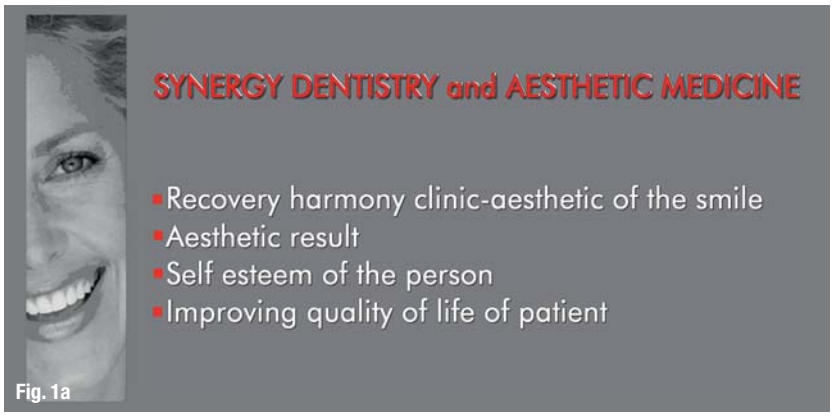


Fig. 1a_Objectives of aesthetic dentistry and aesthetic medicine.
Fig. 1b_Class III/I malocclusion and labial disharmony.

Fig. 2_Dentofacial aesthetic analysis showing incongruent lip relationship with asymmetry.

_Introduction

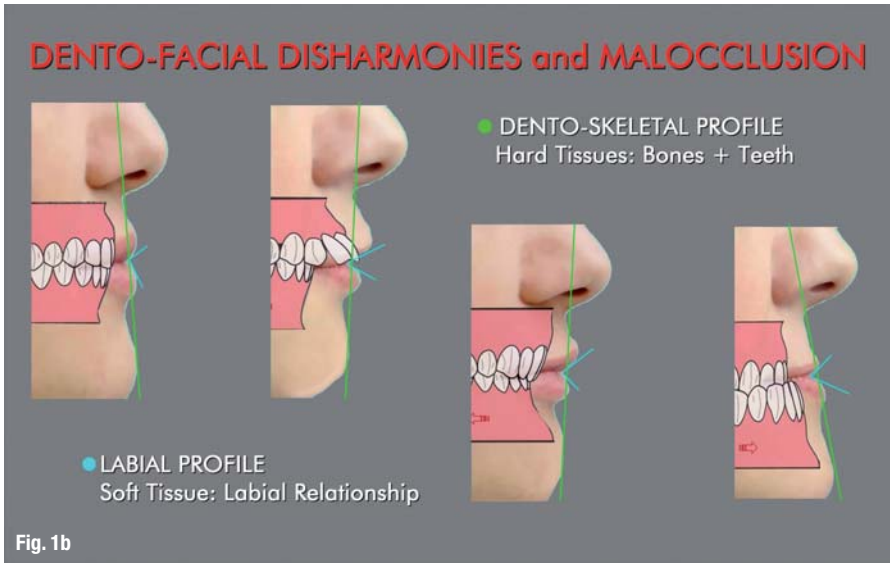
Dentofacial abnormalities are alterations in facial proportion and dental relationships, and such abnormalities in dental and facial appearance often lead to societal discrimination. While orthodontic treatment restores correct dental relationships, it is often not sufficient to solve the facial disharmony and certainly cannot resolve the accompanying psychological difficulties in certain patients (Fig. 1a).

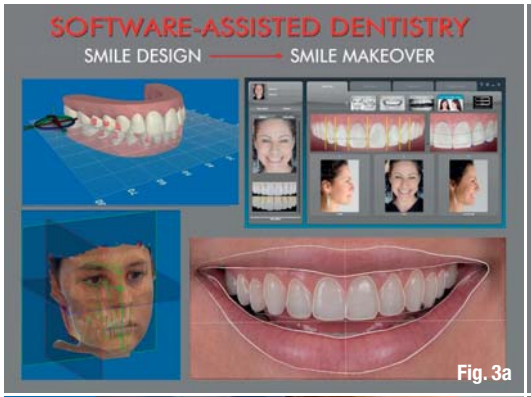
For this reason, aesthetic medicine is utilised to harmonise the final result. Owing to virtual dentistry, the expected smile and face of the patient at the end of orthodontic therapy and aesthetic treatment can be shown to the patient. In order to achieve this, a new diagnostic approach is used in the correction of dental malocclusion: capturing and analysing preoperative photographs in conjunction with CT scans and X-rays with the help of 3-D software specifically for aesthetic dentistry. In this way, the final expected result can be shown to the patient.

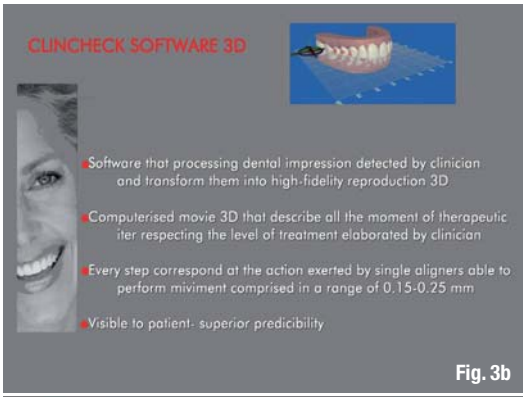
_Aesthetic analysis

Often the patient is directed to a dental consultant because he or she does not like his or her smile and this has affected him or her psychologically such that aesthetic dentistry is inevitable.

The role of the dentist today should be to ensure that the reasons for intervention will be agreed upon with the patient and to ensure predictability of the aesthetic result.







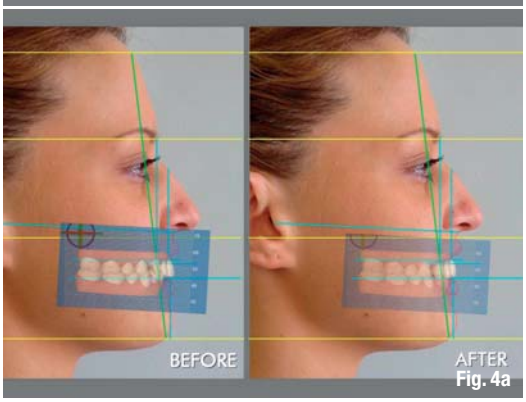
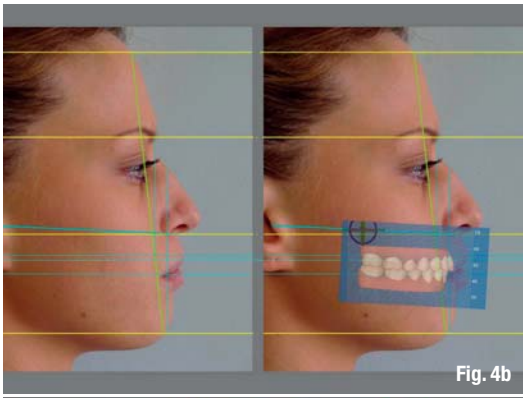
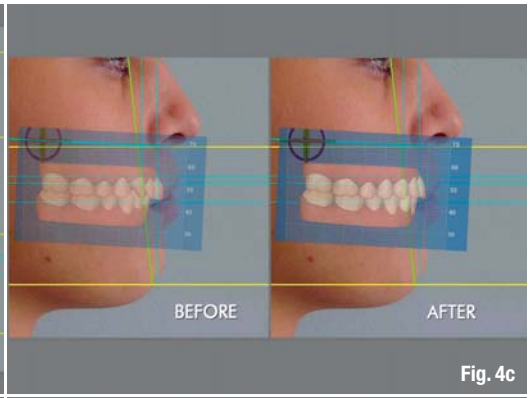


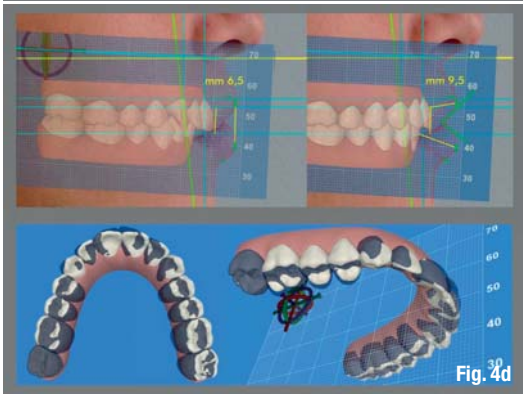
Fig. 3a_Software-assisted aesthetic dentistry.
Fig. 3b_Use of ClinCheck 3-D in dentistry.
Fig. 3c_Superimposition of ClinCheck 3-D image over a 2-D image.
Figs. 4a & b_Dentolabial profile analysis while smiling and with closed lips.

Many dentofacial disharmonies are caused by malocclusion, classified according to Angle's molar relationships (Fig. 1b). The soft tissue of the vestibule and the lips lies over the dental hard tissue and is therefore influenced by the molar relationships.

In examining the patient, we could consider, for example, his or her profile from the labial view. When a patient comes to my office for examination, in recording his or her medical history I pay much attention to preoperative photographs in seeking to determine the cause of aesthetic disharmony.







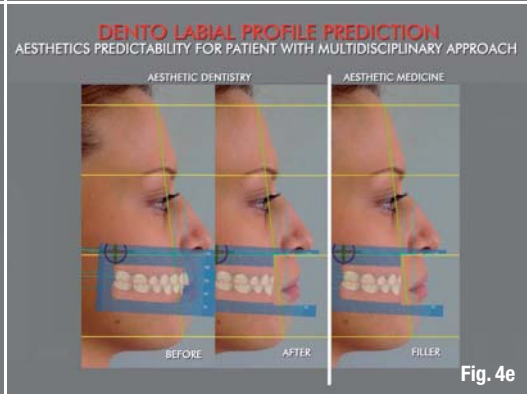


Fig. 4c_Analysis with superimposition: prediction after orthodontic treatment of lip–tooth relationship with closed lips.
Fig. 4d_Prediction of future dentolabial relationship after orthodontic therapy to align dental elements.
Fig. 4e_Aesthetic predictability: the labial relationship with or without cosmetic intervention with a filler.


Fig. 5a


Fig. 5b


Fig. 5c

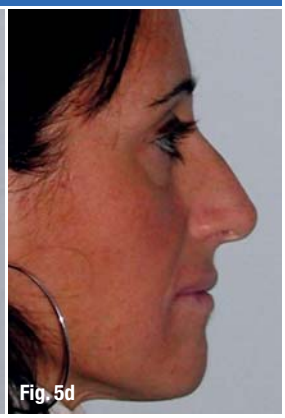


Fig. 5d

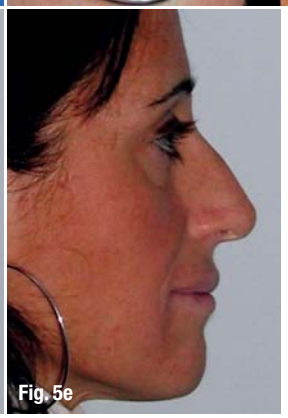


Fig. 5e

Fig. 5a_Initial and final phase of alignment shown using ClinCheck.
Fig. 5b_Lateral intra-oral view before and after orthodontic treatment.
Fig. 5c_Lateral extra-oral view at the start of treatment.
Fig. 5d_Virtual prediction of labial profile after orthodontic treatment.
Fig. 5e_Virtual prediction of labial profile with remodelling.

In the case presented here, three extra-oral photographs were taken from the front and three extra-oral photographs were taken from the side (Fig. 2). Intra-oral examination found that the patient presented with a Class III/I malocclusion with a pronounced overjet. From the extra-oral photographs, the macroscopic incongruity in the labial relationship is evident because although the patient had her mouth closed and lips soft the lips are not touching. The face is asymmetrical in the inferior third and the smile line is not aligned with the occlusal plane, and is oblique and does not run parallel to the bipupillary line.

_3-D software in aesthetic dentofacial analysis

Today, we can design smiles more reliably and in a more sophisticated manner to correct the smile of our patients (smile makeover) using 2-D and 3-D dental software (Fig. 3a). ClinCheck 3-D software (Align Technology) for use by dentists to create transparent orthodontic and dental aligners has proven to be an excellent tool in dentofacial aesthetic analysis, not only from an orthodontic perspective but also from an aesthetic perspective.

In this case, orthodontic therapy using Invisalign (Align Technology) was proposed. Impressions taken of the dental arches, X-rays, photographs and diagnosis with a treatment plan were processed by ClinCheck 3-D, which converts everything into 3-D images to allow the dentist to see and change all the therapeutic orthodontic steps necessary to align the teeth.

ClinCheck is sophisticated software that processes data captured by clinicians, allowing high-fidelity 3-D reproduction, where each step corresponds to the action by a single aligner able to perform movements of 0.12 to 0.25 mm (Fig. 3b).

Biomechanical steps ensure greater predictability in orthodontic clinical cases for both the clinician and the patient. The initial phase of aligner movement and the final situation can be superimposed on a photograph of the face of the patient using 2-D software (Fig. 3c). ClinCheck has among its options a millimetre grid that can be superimposed on the photograph and the steps shown according to conventional reference lines (Figs. 4a–c). In this way, one can obtain a predictable dentofacial analysis from both a dentoskeletal perspective (alignment) and a dentolabial perspective (labial/perilabial repositioning).

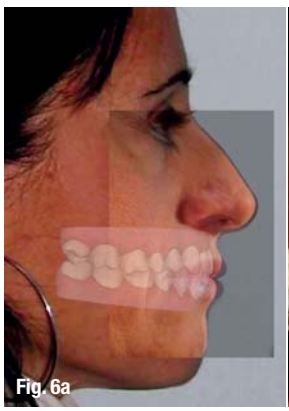


Fig. 6a


Fig. 6b

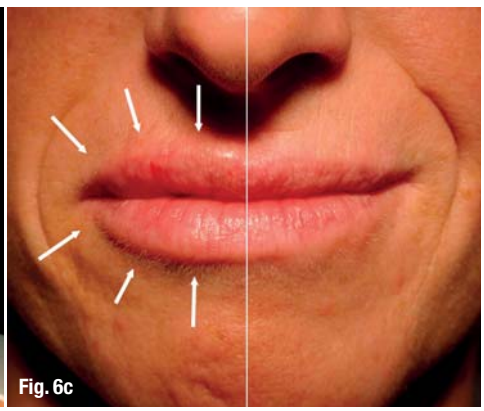


Fig. 6c

Fig. 6a_Aesthetic analysis with superimposition of all the available elements after treatment.
Figs. 6b & c_Immediately post-treatment with labial hyaluronic acid.

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Fig. 7a


Fig. 7b


Fig. 7c

Fig. 8

Figs. 7a–c_Patient after completion of aesthetic dental treatment and aesthetic medical treatment.
Fig. 8_Digital verification of treatment outcome.

The analysis of the clinical case in question demonstrated a drastic closure overjet of about 3 mm as the final post-orthodontic treatment outcome (Fig. 4d). Since the soft tissue of the lips and of the vestibule lie on the skeletal structures, it is possible to predict the future dentolabial relationship (Fig. 4e). At this point, aesthetic predictability for the patient is important because at this stage the combined results of dentistry and aesthetic medicine are shown. In fact it is possible to simulate virtually the new labial dimension following aesthetic dental treatment and cosmetic labial or perilabial surgery.

_Clinical case: Orthodontic treatment and hyaluronic acid

A 47-year-old female patient presented with malocclusion with crowded teeth in the maxilla and mandible and an incongruous dentolabial relationship. The clinical case was treated with 28 upper and 20 lower aligners, with interproximal reduction and attachments in both arches. The superior/inferior midline was moved during the process of sagittal correction (Fig. 5a).

In keeping with the protocol described above, and at the explicit request of the patient, it was decided to approach treatment in accordance with the dentofacial aesthetic analysis obtained using ClinCheck 3-D (Fig. 5b). Using software to show the predicted movement on the grid allows the patient to see the expected changes (showing the lips with or without surgical remodelling; Figs. 5c & d). The preoperative analysis can be verified at the end of therapy by superimposing all of the images available (Fig. 6a).

Once the dental treatment had been completed, we decided together with the patient to increase the lip volume using hyaluronic acid (Figs. 6b & c). About two weeks after surgery, it was possible to verify what had been expected in the analytical aesthetic phase (Figs. 7a–c & 8).

_Conclusion

Combined aesthetic dentistry and aesthetic medicine can offer optimal and predictable treatment in the majority of clinical aesthetic cases.

Using digital technology, the predicted outcome of such treatment for smile design can be shown to the increasing number of patients presenting for aesthetic treatment._

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

_about the author

cosmetic dentistry

Dr Valerio Bini, DDS in dentistry and dental prosthetics from the University of Genoa in Italy, is a cosmetic dentist. He is a member of the European Society of Cosmetic Dentistry, a fellow of SIED (Italian society of aesthetic dentistry), a fellow of the Italian Academy of Esthetic Dentistry, and Align Technology Invisalign certified. He regularly attends courses for specialist clinicians in aesthetic dentistry and aesthetic medicine. He has been a speaker at international conferences on aesthetic dentistry and aesthetic medicine. He is also the author of many articles published in international journals.

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Digital dental photography

Settings for your camera and lighting systems

Author_ Dr François Grossetti, France

Fig. 1

Fig. 1_Barrel of the lens with printed ratios.

_Introduction to digital dental photography

Dentistry as a profession can either be a source of immense satisfaction or a routine treadmill. One of the ways to enhance satisfaction is by using dental photography,[1] which is a wonderful means to appreciate what can be achieved with current treatment, gratifying to both the clinician and patient, and helping to transform routine practice into a passionate pleasure.

We are exceptionally fortunate that digital photographic equipment has evolved to the level we see today.

The ability to capture numerous images on a high-capacity flash memory card and the ability to review the image on the liquid crystal display viewer immediately have liberated us from the confines of film and the inconveniences of the photograph-processing laboratory. This savings in time alone makes digital photography more affordable and less daunting than film photography is. It is fun, and so easy that anyone can learn to obtain great images with just a little training.[2, 3]

Please note that some small point-and-shoot cameras that are not digital single-lens reflex (DSLR) cameras are available and very useful for everyday practice. Small cameras however are not considered adequate[2] for the calibre of photography presented in this article. Therefore, most of the discussion will concentrate on DSLRs.

This article discusses specifically how to simplify the taking of digital images. Once you have set up your camera for digital dental photography, very few adjustments are necessary

for taking all of the cosmetic and surgical photographs required for your practice.

_Camera system

The most versatile camera for dental photography and for achieving the best results is without doubt a DSLR camera. A DSLR offers through-the-lens viewing and metering, precise focusing and accurate framing.

The major advantage of DSLRs is that parallax is eliminated because the viewfinder, lens and image sensor all share the same optical axis. This means that what is seen in the viewfinder is identical to that recorded on the resulting image.[4]

The standard lens of a DSLR has a focal length of 50 mm; a shorter focal length lens, 28 mm for example, is classified as wide angled (e.g. for landscapes), while a longer focal length lens is a telephoto (e.g. for sport or wildlife).

For dental applications, a dual-purpose lens is necessary, firstly for portraiture and secondly to focus down for close-up photography. The ideal choice is therefore a lens that combines both these features, that is, a macro-telephoto lens.

A word of caution about macro lenses: many compact cameras claim macro facilities but this only indicates close-focusing facilities; a true macro is capable of producing a 1:2 or 1:1 magnification. A 1:1 magnification is the ideal and means that the image recorded by the sensor is the same size as the object in real life. For 35 mm format DSLRs, a 1:1 image usually translates to about four maxillary incisors.

Depending on the manufacturer and arrangement of optics within the lens barrel, the focal lengths of macro-telephotos vary from 50 to 1.05 mm. Also, many sensors are smaller than the 35 mm film format and therefore have a multiplication factor. For example, attaching a 100 mm lens to a 35 mm camera body will effectively increase the focal length of the lens to 150 mm, that is, the sensor has a multiplication factor of 1.5 (see below). However, some newer high-end cameras have larger sensors and therefore the lenses do not require a multiplication factor.[4]

It is difficult to recommend manufacturers or models of cameras because the market is rapidly changing and new products are introduced annually.[4] Commonly, Canon or Nikon DSLR cameras are recommended. A basic DSLR body with a 100 mm macro lens can be purchased at many photography stores or online.

Fig. 2

Fig. 3

Figs. 2 & 3_Camera-mounted electronic flashes.

Settings for optimum results

As cameras will commonly require about a 1.5 times increase (conversion) in the setting on

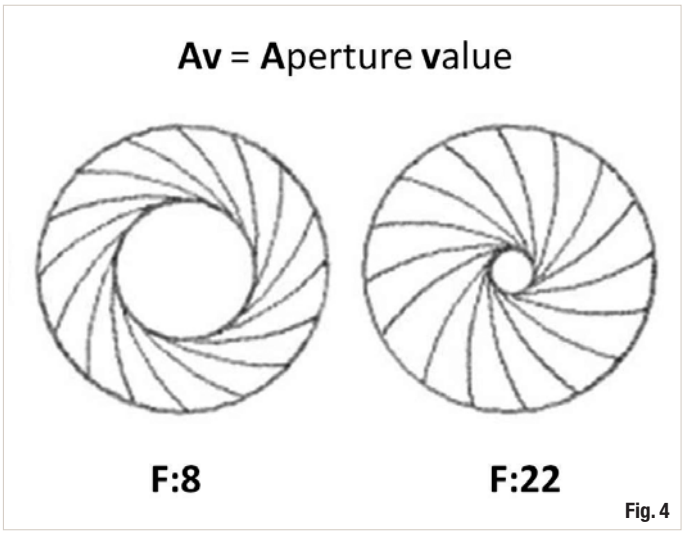

Fig. 4

Fig. 4_Aperture settings.

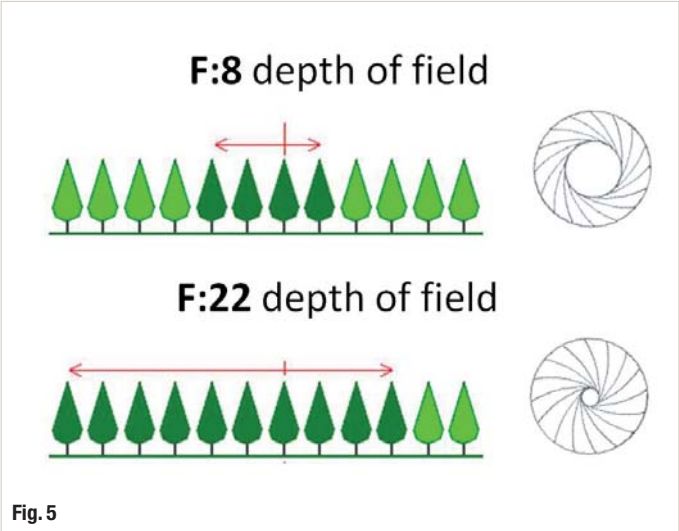

Fig. 5

Fig. 5_A wide-open lens with an aperture of f/8 has little depth of field, but if stopped down to f/22 almost everything from front to back will be sharply focused.

the lens barrel, the lens magnification ratio is closer to 1:15 for portrait photography; 1:3 for dental views, including normal smile and retracted views, as well as occlusal views; and 1:1.5 for dental views, including close-up retracted views.

Please note that these ratios can vary with sensor (with full-frame sensor) and patient face size. Selecting the correct settings is easy because the ratios are etched or printed on the barrel of the lens (Fig. 1), and there are only three sets to think about and to switch between during the shots.[2]

_Lighting system

Many practitioners choose a ring flash for ease of use. A ring flash creates a uniform burst of light, useful for taking pictures of posterior teeth, areas of difficult access and intra-oral images using mirrors. Camera-mounted electronic flashes are available in numerous shapes and sizes. The best way to choose a flash is to visit a dental retail showroom (Figs. 2 & 3).

Fig. 6_Most contemporary cameras have automatic exposure setting.

Fig. 6

_Technical jargon

Aperture or f/stop: This important setting controls the amount (intensity) of light striking the sensor. It is actually an adjustable hole (aperture) in the lens through which the light passes (Fig. 4). The aperture size is calibrated in f-stops and numbered from about f/2.8 to f/32 for most DSLR cameras; the larger the number, the smaller the lens opening. The f-stop affects the depth of field.

Depth of field: This determines which parts of an image are in sharp focus. Cameras are unable to focus on everything simultaneously, unlike the human eye. The depth of field determines the extent of focus in front of and behind the plane of critical focus.

Furthermore, the depth of field for close-up photography is usually small (a few millimetres) and hence the point of focus is crucial for obtaining sharp images. The depth of field varies inversely with the aperture opening. A wide-open lens with an aperture of f/8 has little depth of field, but if stopped down to f/22 almost everything from front to back will be sharply focused (Fig. 5).[5]

White balance: This setting adjusts the camera so that colours in the image look natural.[2] You will want to set your camera's white balance for flash illumination from standard to neutral.

_Settings for optimum exposure

Achieving correct exposure is a quintessential requirement of photography.[5] Exposure is the process of recording light on the digital sensor. The amount (intensity) of light is controlled by the aperture setting, while the sensor's sensitivity is controlled by adjusting the ISO number (discussed below).

More specifically, exposure is the amount of light that strikes the sensor over a specific period.[2] Time is controlled by the shutter speed, measured in fractions of a second.

Most contemporary cameras have automatic exposure, which calculates the shutter speed once the aperture has been set (in aperture priority mode metering, printed Av; Fig. 6). However, with dental photography one aspect in

particular requires attention. It is ensuring an adequate depth of field, which leaves little latitude but to select a small aperture opening, usually f/22 for all dental views.[5] Use f/8 for portraits.[2]

The ISO setting controls the sensitivity of the camera's capture chip or sensor to light. The lower the ISO number (e.g. 100 or 200), the less sensitive the chip, the sharper the image, and the more light needed to obtain a good image. Conversely, a higher ISO setting requires less light, but the image obtained can be noisy or grainy; in other words, less sharp. For dental photography, the recommended ISO setting is 200. Automatic ISO setting is not recommended for dental photography.[2]

You may find that you need to experiment a bit to obtain just the right amount of light for correct exposure by changing exposure compensation.[6]

Flash-to-subject distance influences light intensity, which depends on the inverse-square law. Simply stated, illumination is less bright the further away from its source because it has a greater area to cover.

The inverse-square law is applicable when taking intra-oral images using mirrors. In these circumstances, the light from the flashes travels a greater distance by being reflected off the mirror surface before it can illuminate the teeth. Exposure compensation is therefore necessary (e.g. –0.7) to avoid under-exposed images.[6] Exposure compensation is also necessary (e.g. –1.3) to avoid over-exposed close-up retracted views. However, exposure compensation should be set once for all views.

You may find that you need to experiment a bit to obtain just the right amount of light for correct exposure by changing exposure compensation.[7] If an exposure compensation setting of –1 is necessary on dental views for Nikon bodies (Fig. 7), this may be different for Canon (please note that a shutter speed set to 1/200 in manual mode is necessary for Canon bodies, while for Nikon bodies the shutter speed is set automatically) and other camera/flash set-ups.

_Conclusion

For dental photography, it is essential to have a small aperture opening, f/22 for example, so that as many teeth as possible or a large area of soft tissue is in focus. In theory, to obtain a greater depth of field one could consider using an even smaller aperture, f/32 for example, but this deteriorates the image quality owing to diffraction. Therefore, setting the aperture to smaller than f/22 will diminish image clarity considerably without a substantial gain in depth of field.[5]

Fig. 7

Fig. 7_If an exposure compensation setting of –1 is necessary for Nikon bodies, this may be different for Canon bodies and other camera/flash set-ups.

Optimum settings for dental photography:

_(1:15), f/8 for portrait photography;
_(1:3), f/22 for dental views, including normal smile and retracted views, as well as occlusal views;
_(1:1.5), f/22 for dental views, including close-up retracted views.

This article has offered a simple settings guide based on the author's experience on capturing the standard photographic views required in aesthetic dentistry.[8]_

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

The author wants to thank the ESCD (www.escdonline.eu) and its members for their friendship and support.

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Periodontal tissue repair in the aesthetic zone

Authors_Prof. Giulio Rasperini & Dr Giorgio Pagni, Italy


Fig. 1a


Fig. 1b

Figs. 1a–b_Pocket depth of 13 mm misially to tooth #23. The tooth is stable and the periapical radiography shows angular bone loss with the formation of an infrabony defect.
Figs. 2a-b_The presence of the papilla with no pocket depth between the lateral and the central incisor and between the canine and the first premolar suggest to place vertical relising incision at the base of those papilla and prererve the papilla over the infrabony defect with a buccal incision. The flap is then elevated full-thickness and the defect debrided and misured.

_Introduction

Periodontal regeneration (PR) has provided the practitioner with a more conservative therapeutic strategy for the treatment of infrabony periodontal defects. In fact, PR not only helps reducing periodontal pocket depth (PPD), but it also allows to gain clinical attachment level (CAL) with minimal negative effects on gingival recession (REC), which is particularly important when treating aesthetic areas.

In this paper, we will evaluate different approaches for periodontal regenerative therapy in the aesthetic area and we will suggest how regenerative treatment of infrabony defects may be tailored to even have a positive effect on REC. These approaches are different when compared to traditional guided tissue regeneration (GTR) techniques used for root coverage purposes; instead they help reducing REC by reestablishing a positive periodontal architecture via regeneration and improving the support for soft tissues during wound healing.


Fig. 2a

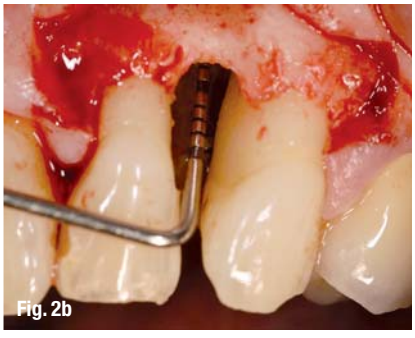
Fig. 2b

_Indication

Traditionally, periodontal therapy is aimed at reducing PPD and improving CAL by eliminating bacterial deposits and factors predisposing to bacterial accumulations. Osseous resection is often required or suggested when a negative osseous architecture is present. Apically positioned flaps or repositioned flaps with removal of the secondary flaps are often used. This therapeutic approach is very predictable and allows maintaining the patients' dentition in the long term even in complex cases. Unfortunately, however, it can only worsen gingival recession and patients treated with traditional periodontal therapy often complain of unaesthetic outcomes of the surgery and root hypersensitivity. Moreover, when deep infrabony defects are present, the practitioner is put on the hotspot of having to choose the lesser of two evils: either sacrifice a large amount of the supporting bone of the neighboring dentition or sacrifice the tooth with the deep bony lesion. PR is particularly indicated in such cases.

_Techniques

With most PR treatments, including the use of Enamel Matrix Derivative (EMD), bone grafts, Guided Tissue Regeneration (GTR) or combinations of the above, regeneration of bone, cementum and a functionally oriented periodontal ligament can be

achieved in the infrabony defect with little increase of gingival recession.

More recently, minimally invasive approaches have been suggested. The Single Flap Approach (SFA) is the elevation of a single flap (either buccal or lingual), keeping intact the tissues on the other flap. The Minimally Invasive Surgical Technique (MIST) is an adaptation of the papilla preservation techniques with the intent to limit flap elevation and mesiodistal extension of the flap. With these approaches, the outcomes in terms of REC worsening were more encouraging and reduced the loss of soft tissue to almost nothing.

Finally, Coronally Advanced Flaps (CAF) in combination with regenerative approaches have been introduced with the intent of stabilising the soft tissue and providing a more stable wound for regeneration to occur. With this approach, a decrease in REC can be achieved, thus not only addressing the loss of attachment but also improving the aesthetic appearance of the area.

The Soft Tissue Wall technique is recommended for the treatment of infrabony defects in the aesthetic area, when one of the involved teeth has also experienced an apical migration of the free gingival margin.

_Soft Tissue Wall technique

In this approach, a horizontal incision is made at the base of the interdental papillae and extended to one tooth mesially and distally from the infrabony defect. A full-thickness trapezoidal flap (with the wider base apically positioned) is then elevated. The remaining facial portion of the anatomic papillae is preserved and de-epithelialised in order to create connective tissue beds to which the flap can be secured at the time of suturing. The papilla over the infrabony defect is dissected at its base and the entire interproximal supracrestal soft tissue is elevated in order to gain proper access to the defect.

After flap elevation, the granulation tissue is removed from the defects by means of metal curettes, followed by scaling and root planning using metal curettes and power-driven instrumentation.

Sharp and blunt dissection into the vestibular lining mucosa is performed to eliminate muscle tension and permit coronal displacement of the flap. Flap mobilisation is considered adequate

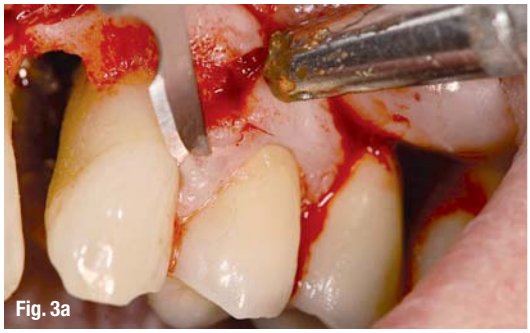
Fig. 3a

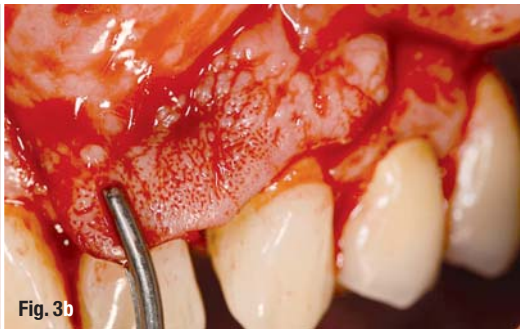
Fig. 3b

Figs. 3a–b_The mesial and distal papilla coronal to the relaxing incisions are de-epithelized and a periosteal relising incision at the base of the flap allows to move the flap coronally without tension.

when the marginal portion of the flap is able to passively reach a level more coronal to the CEJ and to cover the de-epithelialised anatomic papillae.

Two sling sutures are used to stabilise the coronal displacement of the buccal flap. The root surface may be conditioned to remove the smear layer and to obtain a surface free of organic debris. Biological elements as enamel matrix derivative gel (Emdogain®, Straumann, CH) or filling biomaterials in combinations or not with growth factors delivery may now be applied to the defect. A tension-free primary closure of the interdental papilla upon the bony defect is achieved with an internal horizontal mattress suture and the vertical releasing incisions are closed with interrupted sutures.

Usually, patients receive systemic antibiotic therapy and analgesic therapy to prevent postoperative pain and oedema and sutures are checked and removed eight days after surgery. Local plaque control is maintained by a 0.2 % chlorhexidine digluconate rinse (three times daily) for eight weeks. During this period, patients are recalled weekly for professional prophylaxis. At-home mechanical cleaning of the treated area is allowed four weeks after completion of the surgical procedure, using an ultra-soft tooth-brush and a roll technique in apico-coronal direction. Interproximal mechanical cleaning with dental floss is allowed two months after the regenerative procedure. After the initial eight weeks, recall appointments for professional supragingival tooth cleaning are scheduled at one-month intervals for one year post-treatment. No attempt to probe or for subgingival scaling is made before the twelve-month follow-up examination.

Two main hypotheses have been described to explain the mechanisms involved in the regeneration of new periodontal structures including new cementum, new boundle bone and a functionally oriented periodontal ligament.

The first suggested mechanism is the cell occlusion mechanism originally postulated by Melcher in 1976[1] and then revised and integrated by different authors. According to this concept, five cellular

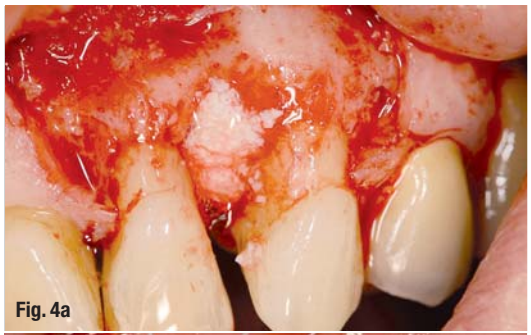
Fig. 4a


Fig. 4b

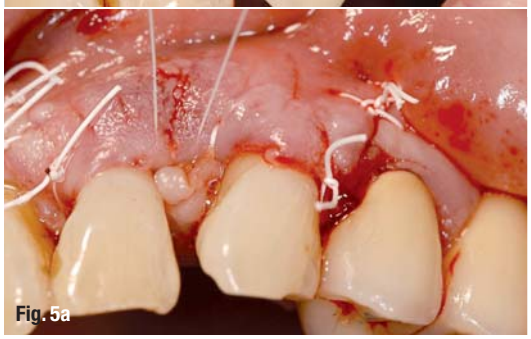
Fig. 5a


Fig. 5b

Figs. 4a–b_The biomaterials are placed into the defect to promote regeneration and to stabilize the clot. In this case, Emdogain (Straumann, CH) was mixed with BioOss (Geistlich CH) graft and protected with a collagen resorbable membrane (BioGide, Geistlich, CH).
Figs. 5a–b_With a 5-0 Gore-Text suture, a sling suture suspended to tooth #22 and one suspended to tooth #23 will stabilize the flap coronally, firm on the teeth, creating a stable buccal Soft Tissue Wall. Now, an internal mattress suture with a 7-0 Gore-Tex will close the papilla, extrofletting the wound margins and allowing perfect adaptation of the flaps.

populations can populate the defect following a surgical intervention: (1) epithelial cells, which are the fastest proliferating and the fastest migrating cells of all five groups, (2) gingival connective tissue cells, (3) alveolar bone cells, (4) periodontal ligament cells, (5) cementoblasts. Guided tissue regeneration uses barrier membranes excluding from the wound area epithelial and connective tissue cells in order to allow the slower cell groups to populate the defect and determine the regeneration of the new ligament. Epithelial cells are in fact inhibited from growing via contact inhibition. Contact inhibition is the natural process of arresting cell growth when two or more cells come into contact with each other or with a solid surface. In a Petri dish cell culture, normal epithelial cells proliferate and migrate centripetally until reaching the borders of the Petri capsule. In GTR, epithelial cell migration stops when the epithelium covers the membrane and comes into contact with the root surface.

The second mechanism is the blood clot stability mechanism. The fibrin component of the blood clot can attach to the alveolar bone, gingival connective tissue and root surface. It has been demonstrated by Wikesjo and coworkers that when the blood clot is not allowed to attach to the root surface, epithelial down-growth occurs and new connective tissue attachment formation is precluded. Instead, if the fibrin attachment to the root surface is not disrupted by any mechanical or physical trauma, the epithelium migrates over the clot and stops migrating when meeting the clot-root interface.

Both of these mechanisms well explain how it is possible to direct wound healing toward regeneration, repair in relation to the adopted technique or biomaterial used, whether it is a membrane, a bone substitute or just a stabilised clot.

The first human histologic evidence of a newly regenerated periodontal ligament dates back to 1982 when Nyman et al.[2] used a Millipore filter on a mandibular incisor which was previously involved in periodontitis, allowing cells originating from the periodontal ligament to repopulate the root surface during healing. Since then, a number of publications have shown histological evidence of a newly regenerated ligament with various surgical techniques, different biomaterials and growth factors.

At the meantime, we should still keep in mind that epithelial down-growth is reversible. Already in the 1980's, Listgarten et al.[3] had demonstrated—in an animal model evaluating access flaps—that while the length of the junctional epithelium did not change between the three months and the twelve months postoperative dates, this measure was "pushed" in a coronal direction thus reducing sulcus depth and increasing the length of the connective tissue attachment.


Fig. 6a


Fig. 6b

Figs. 6a–b_The one-year result shows a pocket depth of 3 mm with a gain of 10 mm when compared to the baseline. In the radiographic image, biomaterial is still detectable with an optimal bone filling.

_Conclusion

In light of this, the importance of maintaining the structural integrity of the gingival tissues as opposed to a pocket elimination procedure (i.e. apically positioned flaps, osseous resective surgery) must be increasingly stressed, especially when surgical treatment in the aesthetic area is warranted.

Periodontal therapy has been reshaped profoundly by the great amount of research and literature produced in the last few decades. What used to be a discipline of large, invasive flaps, has now evolved to a discipline mainly encompassing non-surgical therapy, risk management strategies, and minimally invasive flaps for the treatment of localised defects. This transformation rendered periodontal therapy of the aesthetic area a much less invasive and more acceptable approach, which has to be embraced by all practitioners dedicating their profession toward this exciting and continuously evolving specialty._

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

_contact implants

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Structure and volume in delayed immediate implantation

Authors_Dr Georg Bach & Christian Müller, Germany

_Introduction

Delayed immediate implantation is a viable alternative to immediate implantation, for which there is no distinct evaluation in the literature, and a "regular" implantation after complete osseous healing of the former extraction area, generally associated with volume loss.

Loss of osseous volume after extraction of a non-conservable tooth may be a limiting factor for later implantation. To avoid this problem, many authors recommend immediate implantation, where an implant is inserted immediately after careful and gentle tooth extraction. In cases where immediate implantation is not wanted or possible, delayed immediate implantation after reconstruction of the former tooth area, which is generally carried out three to four weeks after extraction of the non-conservable tooth, is a viable alternative. If the alveolus is (still) mostly intact after extraction, the precondition for immediate implantation can be optimised with a collagen membrane and cone unit.

The procedure presented in the form of the following three exemplary patient cases also acknowledges this easy surgical procedure.

The focus of interest is on procedures for preserving osseous volume after extraction—many authors emphasise the value of closing the wound by means of a "punch", which they claim to have considerable advantages with regard to protection against resorption. Undisturbed growth of bone-forming cells in the former tooth socket is promoted by preventing the connective tissue from growing into the alveolus. However, this procedure presents more of a challenge for the surgical skills of the dental surgeon in terms of production and insertion, and it is more demanding for the patient, both surgically and financially.

The insertion of so-called collagen membrane and cone units can simplify closure of the alveolus considerably and avoid removal of the punch at a later time. A second procedure is not required because of the absorbability of the material, since the collagen membrane cone unit does not have to be removed.

_Procedure

The manufacturer recommends the following procedure for the insertion of collagen membrane and cone unit:

Case 1
Due to an extensive dental history, none of the anterior teeth of the maxilla were conservable **(Fig. 1a)** and had to be removed gently **(Fig. 1b)**. Immediately following extraction of the teeth, collagen and membrane cones were inserted **(Fig. 1c)** for the purpose of socket preservation and integration of the previously produced **(Fig. 1d)** interim prosthesis.


Fig. 1a

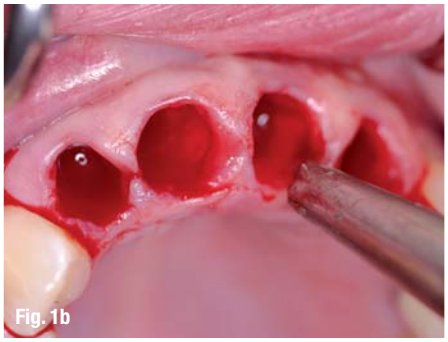
Fig. 1b

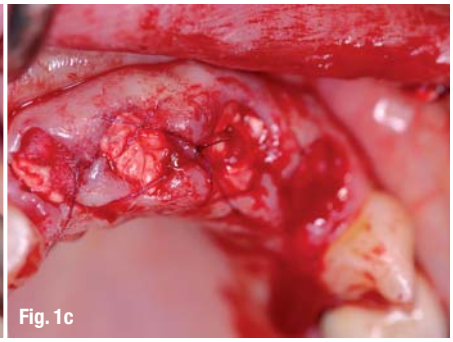
Fig. 1c


Fig. 1d


Fig. 1e


Fig. 1f


Fig. 1g


Fig. 1h


Fig. 1i

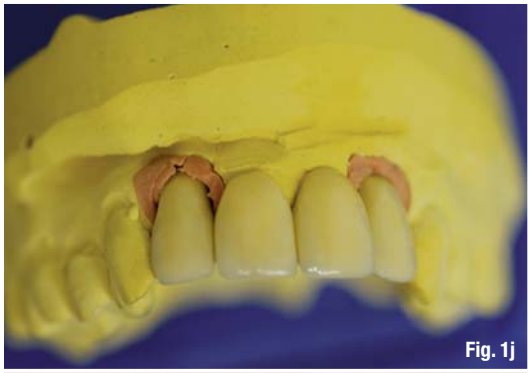
Fig. 1j

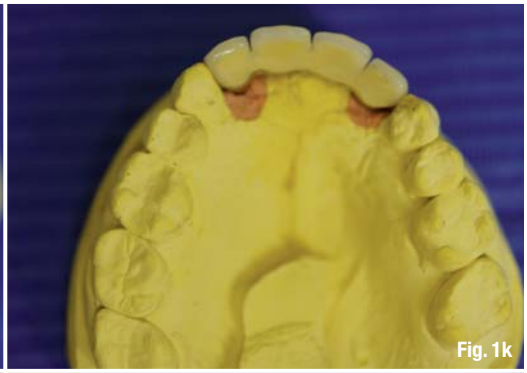
Fig. 1k


Fig. 1l

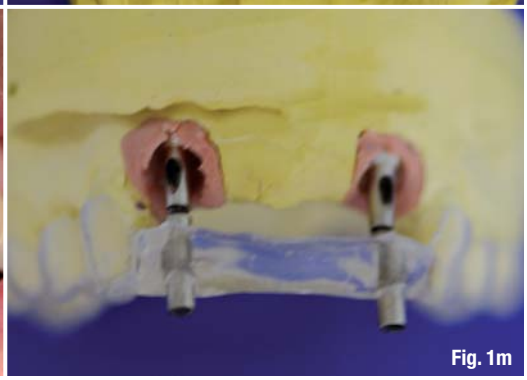
Fig. 1m

Figures 1e and **1f** show the clinical situation one and four weeks after surgery; **Figure 1g** shows the situation after delayed immediate implantation. The intraosseous suture material was removed seven days after implantation **(Fig. 1h)**. After completion of the osseointegration phase, the casting was done **(Fig. 1i)**, followed by insertion of the abutments using the prepared insertion aid **(Figs. 1j–l)**. **Figure 1m** shows the exact conformity between planning (template) and achieved result (abutments).

Case 2

In the right half of the maxilla, the two remaining posterior teeth were fractured and deeply damaged by caries **(Fig. 2a)**, thus non-conservable. The two alveoli remained largely intact **(Fig. 2b)** after gentle removal of the roots, and a customised collagen membrane and cone unit was inserted **(Fig. 2c)**. The suture material was removed one week after surgery **(Fig. 2d)**. After four weeks, the bone bed showed no irritation and a primary reconstruction to a large extent. We were able to insert two implants after this short waiting period. **Figure 2e** shows the condition after implant bed drilling; **Figure 2f** shows the two inserted implants. Please also see the corresponding dental panoramic X-ray **(Fig. 2g)**. Upon completion of the osseointegration period, the implants showed no irritation **(Fig. 2h)**, so that the impression could be taken with a customised spoon **(Fig. 2i)** and the dental lab work **(Figs. 2j & k)** was executed.


Fig. 2a


Fig. 2b


Fig. 2c


Fig. 2d


Fig. 2e


Fig. 2f

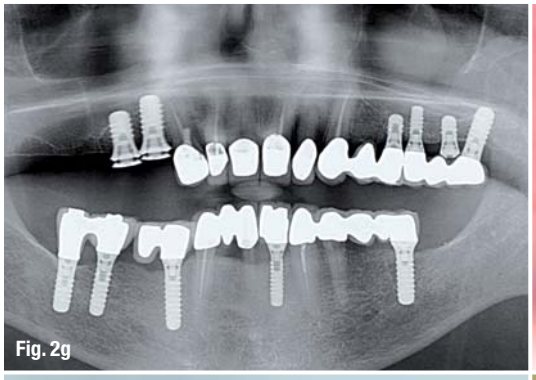
Fig. 2g

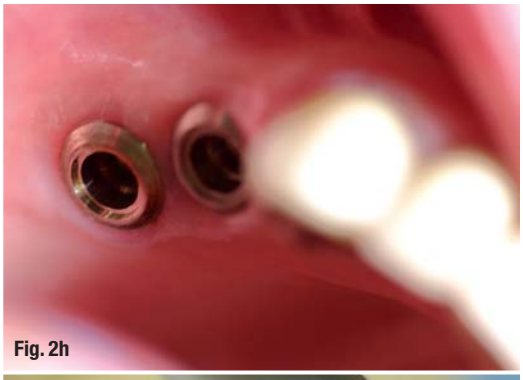
Fig. 2h

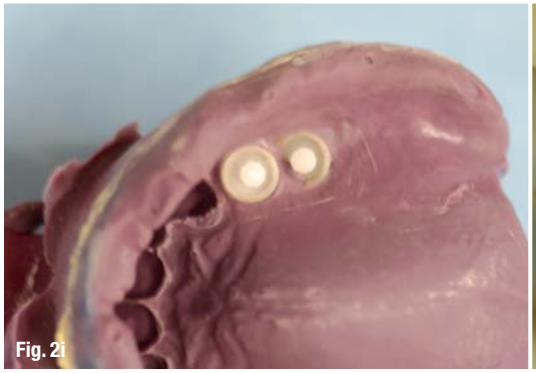
Fig. 2i


Fig. 2j


Fig. 2k


Fig. 2l


Fig. 2m


Fig. 2n

Figure 2l shows the inserted abutments, and **Figure 2m** shows the integrated product in the patient's mouth. **Figure 2n** shows the corresponding sagittal view.

1. Preparation for a tight closure

After gentle and non-traumatic extraction of the non-conservable tooth, the marginal gingiva is minimally detached to the alveolar process so that the free membrane side of the collagen membrane and cone unit can be inserted.

2. Customising collagen membrane and cone unit

Moistening is to be avoided because this would make it more difficult to achieve a good fit to the alveolus. Rather, the collagen cone is fitted to the alveolus with the scalpel, and the membrane is configured with small scissors to facilitate insertion under the marginal edges, while at the same time achieving an ideal defect-congruent coverage.

To achieve this, the dimensions of the membrane should be approximately 1–2 mm wider than the diameter of the alveolus.

3. Insertion of collagen membrane and cone unit

Using dry, anatomical, wide tweezers, the collagen membrane and cone units are inserted into the alveolus and then pushed in deep with a moist swab. The membrane part should be seated exactly at the level of the marginal gingiva. Now the free and slightly oversized part of the membrane is pushed carefully under the edges of the marginal gingiva.

4. Protective measures

A back-and-forth suture with a non-absorbable suture material will secure the position of the collagen membrane and cone unit in the alveolus and also adapt the free gingiva edges on the membrane.

_Case presentations

The following three patient cases serve to illustrate and ultimately evaluate the procedure of a delayed immediate implantation using an absorbable collagen membrane and cone unit.

Case 1: Four non-conservable teeth in the anterior maxilla

Due to a trauma of the anterior teeth during adolescence, the patient received endodontic treatment and crowns on the four front teeth, which—after recurring problems—resulted in apicoectomies. The second set of crowns at ten years after the first prosthetic treatment was followed immediately by a second resection due to persistent discomfort. The patient is in her late thirties, and now the four front teeth 12, 11, 21, 22 are no longer conservable. They showed mobility grades of I–II, high circular probing depths and bleeding on probing.

After a removable interim prosthesis 12–22 was produced, the four teeth in the anterior maxilla


Fig. 3a


Fig. 3b

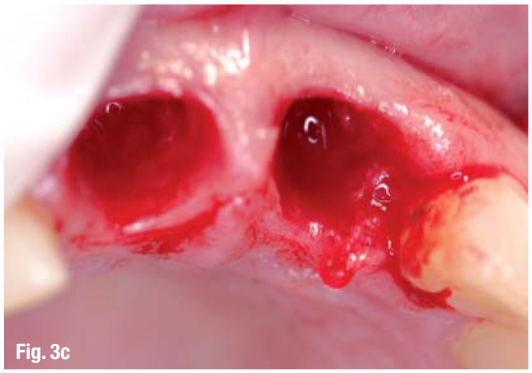
Fig. 3c

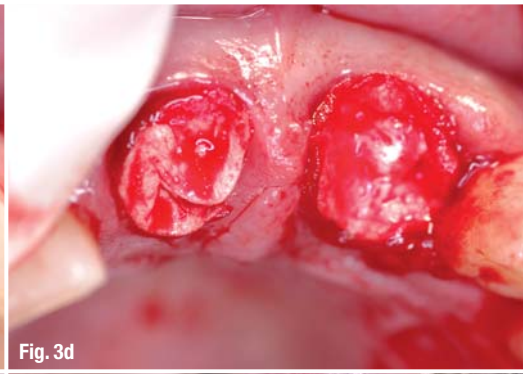
Fig. 3d

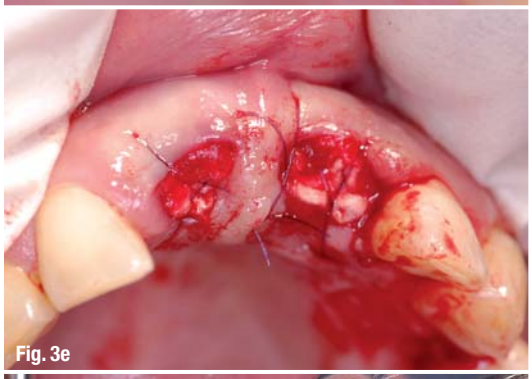
Fig. 3e


Fig. 3f

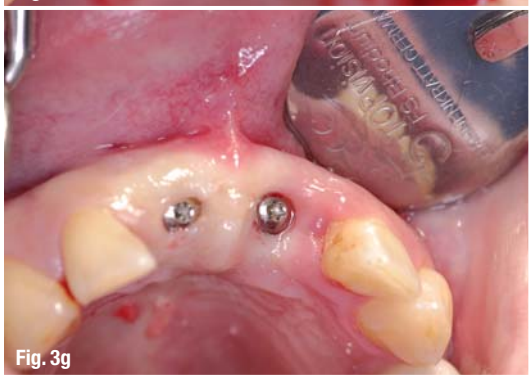
Fig. 3g


Fig. 3h


Fig. 3i

Case 3

The teeth were marked by a severe previous periodontitis, and the two upper central incisors were damaged so severely **(Fig. 3a)** that they were considered non-conservable. After minimally invasive removal of the two upper central incisors **(Fig. 3b)**, the alveoli of the incisors were found to be intact **(Fig. 3c)** so that, for the purpose of socket preservation, collagen cone and membrane units were inserted **(Fig. 3d)** and fixated **(Fig. 3e)**. Two implants **(Fig. 3f)** were inserted after primary healing of the soft tissue. **Figure 3g** shows the immediate postoperative status; **Figure 3h** shows the status after one week. The two implants were fitted with crowns upon completion of further eight weeks of healing time. **Figure 3i** shows the clinical findings after six months within the scope of a recall appointment.

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were extracted gently and the periradicular granulation tissue was also removed as non-traumatically as possible. The wound was closed with four collagen membranes and cone units; they were fitted to the alveolus by resizing the collagen part. The membrane part facing the oral cavity was adapted to the edges of the wound to enable a tight closure with suture material. Four weeks after extraction of the teeth, the former tooth area 12–22 was non-irritated with good remaining structure and volume. ITI implants were inserted in areas 12–22 which were fitted with a fixed bridge after twelve weeks of healing.

Case 2: Free-end situation in the right half of the maxilla

The free-end situation in the right half of the maxilla that occurred 31 years ago had been fitted with a disto-cantilever bridge 16-15-14 BM-KM-KM. At a later time, both of the two premolars (abutment teeth) received endodontic treatment and a root filling. Both teeth fractured so unfavourably that they were non-conservable. The patient requested "the same treatment, but with implants instead of teeth".

To prevent further fractures of the teeth that had fractured on the subgingival level, the remaining two root portions were extracted gently and carefully. Two collagen-cone units were customised with a scalpel (collagen part) and scissors (membrane) in such a way that they were flush with and filled the former alveolus in addition to providing a finish. The final closure was achieved by way of intraosseous sutures. A delayed immediate implantation was also carried out after about four weeks; two implants were inserted in areas 14, 15, which were again fitted with a cantilever bridge (16 as a premolar pontic) after several weeks of osseointegration.

Case 3: Replacement of periodontally severely damaged teeth 11, 21

The patient in her mid-thirties had already lost several teeth in the lateral dental area of the maxilla. The fact that she is a heavy smoker was certainly a considerable co-factor in this unpleasant situation. A trauma of the front teeth (a fall at home) that had occurred many years ago had required splinting of the two upper central incisors which now, only ten years after the procedure, showed a high degree of mobility. The patient also complained of pain when biting.

After the production of a clip-free interim partial prosthesis, the two upper central incisors were extracted, taking care to avoid any traumatisation. A collagen membrane cone unit was also used for treating both of the two alveoli. Since the patient was not prepared to stop smoking, maintaining structure and volume was just as important as achieving a fast and tight closure by using the collagen membrane and cone unit. After four weeks of primary healing time, two implants were inserted in areas 11, 21, which then received two crowns as a supra-construction after eight weeks.

_Evaluation

The procedure presented here is definitely not a substitute for a proven treatment scheme, but it can serve to simplify it. If the alveolus is largely intact, which must be defined as the precondition for executing the treatment steps described here, a GBR procedure can be performed quickly and without any further trauma to the tissue. The goal is to conserve as much volume of the former tooth socket as possible, thus creating favourable preconditions for a delayed immediate implantation. The procedure has obvious limitations in cases where the former tooth socket has been largely destroyed (due to a complicated extraction or previous procedures resulting in a loss of most of the buccal bone lamella), where the non-conservable tooth shows a profound infection, and in situations where the patient does not want the use of materials of animal origin.

Information regarding the employed collagen product: Absorbable collagen membrane-cone —PARASORB-Sombrero®—Absorbable local hemostatic agent with membrane for guided bone regeneration of equine origin. Manufacturer: RESORBA (Germany)._

The authors hereby confirm that there is no conflict of interest.

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Kuraray Europe introduces a unique desensitiser: TEETHMATE DESENSITIZER

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_Number of treatments per package: 130 treatments.
_Maximum leaving time after mixing: 10 minutes.
_Patients should avoid drinking and eating for 45 minutes after treatment.
_Bond strength with adhesives: non-significant decrease or increase.
_Bond strength with cement: non-significant decrease or increase.

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Progressive educational collaboration in Asia Pacific region


Fig. 1


Fig. 2

Fig. 3

Fig. 1_Vice-Dean Dr Lertrit Sarinnaphakorn welcoming guests to the MoU signing ceremony.
Figs. 2–4_The MoU signing ceremony.

Fig. 5_A group photograph of the MoU partners after the seminar at VIE Hotel Bangkok on the evening of 26 August.
Figs. 6–9_Photographs during the seminar.

_On 26 August 2013, a memorandum of understanding (MoU) was signed that officially launched an international joint project to establish the MiCD and TMJA Harmony International Training and Treatment Center at the Faculty of Dentistry of Thammasat University.

The progressive international collaboration in the field of dentistry was initiated between Thammasat University, a private training institute and three dental manufacturers to establish an advanced international training centre. This is a unique collaboration in the sense that three major sectors of dentistry (education, clinical and manufacturing) have come together to promote knowledge, skills and attitudes to enhance quality, healthy, comprehensive dentistry in the Asia Pacific region.

The Faculty of Dentistry of Thammasat University and the Vedic Institute of Smile Aesthetics (VISA) in Nepal from the education sector and Tekscan in the USA, SHOFU Dental Asia-Pacific in Singapore and Bio-Research Associates in the USA from the dental industry have joined hands to offer international skill-based training, research, publication and global networking in the field of minimally invasive cosmetic dentistry (MiCD) and teeth, muscles, joint and airway (TMJA) harmony (occlusion, temporomandibular joint dysfunction and dental sleep medicine) dentistry.

Fig. 4

Fig. 5


Fig. 6


Fig. 7


Fig. 8


Fig. 9

It is hoped that this unique model of partnership between a university, private educational institute and the dental industry will be very successful in clinical dental education and of benefit to both practitioners and patients.

The MoU was signed by Acting Dean Prof. Tipawan Techanitiswad on behalf of Thammasat University, President of VISA Dr Sushil Koirala, Managing Director of SHOFU Dental Asia-Pacific Patrick Loke, Vice-President of Bio-Research Associates Greg Kamyszek and International Sales Manager at Tekscan Philip Gorski.

The agreement has four fundamental areas of collaboration between the concerned parties:

1. the development of an international training centre for education and treatment in advanced dentistry;
2. the introduction of MiCD and TMJA harmony dentistry as clinical concepts and protocols in this international training centre;
3. the creation of certified MiCD and TMJA harmony skill-based training programmes to train clinicians and academics in the Asia Pacific region; and
4. the development of collaborative research activities and scientific publications on MiCD and TMJA harmony dentistry.

In his speech at the MoU signing ceremony, Dr Koirala, originator of the concepts and protocols of MiCD and TMJA harmony dentistry, expressed his sincere gratitude to all those who had put in their utmost efforts and extended their full support to make this international collaboration possible and expressed the hope that the centre will truly promote the concepts and protocols of MiCD and TMJA harmony dentistry through skill-based, well-structured training programmes at the centre, which will help clinicians to achieve the best clinical results with minimal biological cost and high patient satisfaction.

Dr Koirala explained that his group had decided to establish the international training centre at Thammasat University because it is centrally located in Asia and meets all the requirements for advanced dental training, such as the progressive and collaborative attitudes of university management and faculties, and modern dental equipment with all the necessary infrastructure and facilities. In addition, the institution embodies the deeply rooted Thai culture of good hospitality, and Thailand boasts a well-established reputation as a popular tourist destination in Asia.

During their speeches at the MoU signing ceremony, all the other collaborative partners expressed their pleasure at the centre being housed at the Faculty of Dentistry of Thammasat University and assured their support of the project to establish a truly international training centre in the region.

At the brief meeting held after the MoU signing ceremony, it was decided that the official inauguration of the MiCD and TMJA Harmony International Training and Treatment Center will be held on 21 February 2014 during the faculty's 18th anniversary celebrations and that the first official international training programme on TMJA harmony dentistry will run from 28 April to 2 May 2014.

An auspicious seminar, organised by the Faculty of Dentistry of Thammasat University, was held on the evening of 26 August at VIE Hotel Bangkok. The guest speaker, Dr Koirala, highlighted the aims and objectives of the project during his lecture. Dr Koirala and Vice-Dean Dr Lertrit Sarinnaphakorn explained the details about the centre and called for all dental professionals (academics and clinicians) in Thailand to join hands in the mission of sharing knowledge and skills for better patient care and professional unity. The seminar was chaired by Dr Rajapas Panichuttra, President of the Thai Association of Dental Implantology._

International Events

2013

IFED 8th World Congress
18–21 September 2013
Munich, Germany
www.ifed-2013.com

ESCD Annual Meeting
3–5 October 2013
Turin, Italy
www.escdonline.eu

SCAD Annual Meeting
3–5 October 2013
Denver, CO, USA
www.scadent.org

2nd Asia-Pacific Edition
9th CAD/CAM & Digital Dentistry
International Conference
5 & 6 October 2013
Singapore
www.cappmea.com


Turin. Photo: Giancarlo Liguori

EAO 2013
16–19 October 2013
Dublin, Ireland
www.eao.org

BACD Annual Conference
7–9 November 2013
London, UK
www.bacd.com

5th Dental–Facial Cosmetic
International Conference
8–9 November 2013
Dubai, UAE
www.cappmea.com/aesthetic2013

ADF Annual Dental Meeting
26–30 November 2013
Paris, France
www.adf.asso.fr

Greater New York Dental Meeting
29 November–4 December 2013
New York, NY, USA
www.gnydm.com

2013

30th Annual AACD Scientific Session
30 April–3 May 2014
Orlando, FL, USA
www.aacd.com

EAED 28th Annual Meeting
29–31 May 2014
Athens, Greece
www.eaed.org

AAED Annual Meeting
5–8 August 2014
Santa Barbara, CA, USA
www.estheticacademy.org

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_all the image (tables, charts, photographs, etc.) captions;
_the complete list of sources consulted; and
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