An innovative adhesive luting protocol

Between BOPT and BTA:
Shaping the gingival contour

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Dear Reader,

It is interesting to note the trends in cosmetic dentistry training these days. Cosmetic dentists are spending time and money learning various smile design techniques and protocols. In recent years, the use of computer-guided digital devices (hardware and software) in smile design has become quite popular and many clinicians are already trained in different kinds of digital smile design protocols.

If we carefully analyse digital smile design techniques or protocols, it can be established that they generally follow three steps: photography, digital analysis (calculation) and digital wax-up (drawing, cut and paste). After these clinical steps, dentists have two choices for achieving the final trial smile. The first and most popular one is a laboratory-fabricated acrylic or composite restoration and the other one is CAD/CAM fabricated. For the manual approach, the laboratory technician has to manually wax up the digital design. Even though digital smile design uses computer-guided techniques and protocols, the entire design process is not that as fast as many clinicians may think. This is because the dentist needs to develop specific computer graphic skills, be involved in digital communication with the laboratory, as well as pursue emotional counselling and marketing tactics.

Several months ago, I asked some of my close Asian, American and European friends who have completed various digital smile design courses about the use of digital smile design protocols in their daily practice. It was surprising to learn that none of these popular cosmetic dentists regularly use digital smile design in their practice. They frankly informed me that such techniques are time-consuming and computer design is not as easy as the day-to-day restorations that they do. I was also told that they use digital smile design protocols only when they need to present clinical cases for conferences or seminars.

I was quite pleased with their candid comments, as I rarely use digital smile design myself, because I do not want to give stock smiles to my patients based on universal design formulas. I apply art more than science when designing new smiles for my patients. I respect my patients’ personal desires and needs and guide them in achieving natural and realistic smiles with low biological cost. I have never sold cosmetic dentistry using the emotional counselling tactics of digital smile design, because I firmly believe that exploiting emotions to sell cosmetic dentistry actually constitutes emotional blackmailing of patients.

Keeping all of the above in mind, I have recently developed a simple “Quick Smile Design” concept, which is not new but a logical modification of the age-old direct composite mock-up technique. The beauty of this simple technique is that it is fast, realistic and predictable. You do not need to open your computer and spend time using Photoshop. Your patients will instantly be able to give their comments about the aesthetics and level of comfort of your smile design. You do not need to acquire computer graphic skills. Moreover, this technique indirectly enhances the dentist’s direct cosmetic restoration skills. I hope you will have the opportunity to learn about it in the upcoming issue of the cosmetic dentistry magazine.

In this issue, we have also selected some articles on smile design and cosmetic restorations. I hope you will enjoy reading them.

Sincerely,

Dr Sushil Koirala
Editor-in-Chief
Dear Reader
Dr Sushil Koirala, Editor-in-Chief

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Prof. Claus-Peter Ernst

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Fig. 1: Unattractive, old porcelain-fused-to-metal restorations on teeth #11 and 21 in a 20-year-old patient.

Fig. 2: Close-up photograph of the functionally intact anterior crowns showing unattractive PFM work due to the metal framework showing through.

Fig. 3: Incisal view of the existing crowns.

Fig. 4: The self-conditioning ceramic primer Monobond Etch & Prime is scrubbed in for 20 seconds.

Fig. 5: Additional reaction time of Monobond Etch & Prime of 40 seconds.

Fig. 6: Apical view of the IPS e.max Press lithium disilicate crown after Monobond Etch & Prime had been rinsed off.

Anterior crowns come in many different variations, from purely functional to highly aesthetic, depending on the requirements and means of the patient, the skill of the dental technician, availability of materials, and preparation and cementation procedures used. Many anterior crowns considered to be aesthetic in the past no longer meet the demands of today’s patients. The example detailed in this article is a case in point.

When she presented to our practice, the 20-year-old high school graduate wished to have the crowns on her two central incisors replaced (Fig. 1). At the age of 14, she had sustained anterior tooth trauma that apparently damaged the mesio-incisal part of the incisal edges of both teeth. The dentist she had consulted at that time restored her teeth with porcelain-fused-to-metal (PFM) crowns. Even though the extent of the trauma can no longer be assessed, today’s alternative—in light of the patient’s young age in particular—would most probably have been a direct composite restoration.

Figure 2 shows the two central incisors in detail from the labial aspect and Figure 3 shows an incisal view. The crowns did not exhibit any functional defects. As a result, the main treatment aim was to improve the aesthetic appearance of the anterior teeth as requested. Subsequently, the patient was informed about the treatment procedure, in particular about any possible additional preparation requiring the removal of tooth structure, as well as the cost involved.

The treatment was begun at a separate appointment. The restorations were fabricated by the dental
luting protocol trends & applications

Presssed all-ceramic IPS e.max lithium disilicate (Ivoclar Vivadent) crowns were selected for this case, since they are the first choice for this type of indication. This has been confirmed by numerous clinical studies, including the recently published German S3 Clinical Practice Guideline on ceramic restorations.

The teeth were anaesthetised at the placement appointment. The crowns were removed and the bonding surfaces were carefully cleaned with ultrasound and a fluoride-free cleaning paste. Since the new Variolink Esthetic DC (Ivoclar Vivadent) had been chosen as the luting material, the crowns were tried in with the corresponding try-in pastes. An immediate match to the adjacent and the mandibular anterior teeth was achieved with the Neutral shade. No adjustments were necessary with regard to a lighter (Light) or darker (Warm) shade of the luting composite. We attributed this excellent match to the dental technician having selected the shade at the chairside. The extra expense of this step far outweighs the inconvenience of having to make numerous adjustments or new restorations because of a shade mismatch.

Conditioning of the crown

Saliva and residue of the try-in paste were removed (Ivoclean, Ivoclar Vivadent) from the crowns before they were conditioned. It is advisable to fabricate a “handle” to allow the inner crown surfaces to be conditioned without having to touch the crown with the fingers. In this case, the crowns were attached to a brush holder with a light-curing provisional composite. This handle also allowed the crowns to be placed with ease during the luting procedure. As an alternative, an OptraStick (Ivoclar Vivadent) could have been used. Hydrofluoric acid etching of glass-based ceramics and subsequent silanisation has been an accepted conditioning method for decades. The newest studies confirm its effectiveness. It even generates a strong bond on state-of-the-art ceramic materials such as hybrid ceramics. An acid concentration of 5 per cent has been established, which represents a reasonable compromise according to the latest research.

The new Monobond Etch & Prime (Ivoclar Vivadent), which was introduced at the 2015 International Dental Show, is a conditioning material based on ammonium polyfluoride. The product is actively scrubbed on the bonding surface (Fig. 4) for 20 seconds, thereby removing any contamination with saliva or silicone. After another 40 seconds (Fig. 5), the ammonium polyfluoride reacts with the ceramic surface and produces a rough etching pattern. Even though this pattern is not as pronounced as that of conventional 20 seconds etching with 5 per cent hydrofluoric acid, the bonding results achieved in both cases are comparable. The enlarged surface created in this way helps to activate the ceramic bonding surface.

The restoration is subsequently rinsed to remove the ammonium polyfluoride and its reaction products. The reaction of the silane and the activated glass-ceramic then begins. A thin layer of chemically bonded silane remains on the ceramic after its distribution with blown air. This product, therefore, combines the steps of hydrofluoric acid etching and silanisation and it even appears to render cleaning with Ivoclean superfluous. The currently available in vitro data justifies using this new product with due care to replace the hydrofluoric acid etching and silanising method. Even though it has not been shown to improve the bonding values in relation to the established references, no negative effects on the adhesive bond have been found to date either. Moreover, since the adhesive bond to glass-ceramics is considered to be the most unproblematic interface in the bonding process of indirect restorations, no clinical irregularities are to be expected.

Conditioning of the prepared teeth for the adhesive cementation of the restorations under cotton roll isolation. Retraction cords were placed in the sulcus to prevent any contamination with sulcular fluids. Fig. 7. Fig. 8: Incisal view of the prepared teeth.

Application of Adhese Universal adhesive with the pen applicator. Fig. 9: Application of Adhese Universal adhesive with the pen applicator. Fig. 10: Light polymerisation of the adhesive after careful distribution with blown air. Fig. 11: The polymerised adhesive layer on teeth #11 and 21.
In the case presented, the crowns could even have been placed by conventional or self-adhesive means. The loss of retention would have been as unlikely as the occurrence of a ceramic fracture due to inadequate adhesive support. Figure 6 shows one of the two crowns after Monobond Etch & Prime had been rinsed off and the surface dried with blown air.

Cementation of the crowns

Variolink Esthetic DC was used for the adhesive cementation of the crowns. As this luting system is a full adhesive, sufficient moisture control must be ensured. Owing to the equi-gingival preparation margin, the healthy condition of the gingiva and the excellent cooperation of the patient, the placement of a rubber dam was not essential. Therefore, cotton roll isolation was used to seat the crowns. Two retraction cords (Ultradent Products) were placed to prevent any contamination with sulcular fluids (Figs. 7 & 8).

The bonding surfaces were cleaned with a fluoride-free prophy paste. Next, Adhese Universal adhesive (Ivoclar Vivadent) was applied from the pen applicator (Fig. 9). The remaining thin enamel margin was not etched, in order to prevent any gingival bleeding. Adhese Universal was scrubbed into the conditioned tooth surface for >20 seconds as stated in the directions for use. According to the manufacturer, this time should not be reduced, as it is not sufficient to simply paint the adhesive on to the tooth surface. Next, the adhesive was dried with blown air until an immobile, glossy film was left. The adhesive was then light cured for 10 seconds (Fig. 10).

Since the universally compatible adhesive forms a considerably thinner film than does Heliobond (Ivoclar Vivadent), for example, it can be light cured without encountering any subsequent problems of fit or bite elevation. The polymerised adhesive layer on teeth #11 and 21 is visible in Figure 11. Figures 12 and 13 show the adhesively cemented IPS e.max lithium disilicate crowns at the final follow-up appointment, four weeks after the treatment. The gingiva was free from any irritation and the crowns blended in smoothly with the surrounding teeth. The tremendous improvement in the appearance of the anterior teeth achieved with the all-ceramic restorations on teeth #11 and 21 is visible in the close-up photograph shown in Figure 14. For the first time in many years, the patient dared to smile again (Fig. 15).

Conclusion

It takes quite a bit of courage to use innovative products and procedures, such as those described in this article. Adequate clinical data is not yet available, let alone the much-needed long-term studies. Nonetheless, a start must be made somewhere. For those dental practitioners who would like to be rid of hydrofluoric acid sooner rather than later, the described self-conditioning glass-ceramic primer may offer a viable option.

Since the etching time has a significant influence on the strength of the ceramic when hydrofluoric acid is used to condition ceramic restorations, the specifications of the manufacturer must be strictly observed. IPS e.max Press lithium disilicate should be etched for 20 seconds if 5 per cent hydrofluoric acid is used. Other conventional glass-ceramics require 60 seconds of etching. DeguDent (DENTSPLY) recommends that its material CELTRA be etched for 30 seconds. The reaction time of Monobond Etch & Prime is 60 seconds on all types of ceramics. Thus, it offers a first step in the direction of error prevention. It remains to be seen whether external studies can confirm the effectiveness of the product in establishing an adhesive bond on ceramics other than those from Ivoclar Vivadent.

contact

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Between BOPT and BTA: A case report on shaping the gingival contour around tooth-supported restorations by means of provisional resin crowns

Author: Dr Feng Liu, China

**Case report**

A 48-year-old female patient whose general health condition was good, was referred to the Peking University Hospital of Stomatology in Beijing in China in 2008. The patient’s main concern was the restoration of her maxillary anterior teeth that had been compromised by severe dental caries and treated with root canal therapy.

**Fig. 1**: Frontal view of the patient’s smile before treatment.

**Fig. 2**: Pre-op photograph showing the occlusal relationship of the anterior teeth.

**Fig. 3**: Pre-op photograph of the maxillary anterior teeth.

**Fig. 4**: Pre-op photograph of the maxillary anterior dental arch.

**Fig. 5**: The inclined axis of the tooth would have resulted in an unfavourable aesthetic outcome.

**Fig. 6**: The labial side of the restorations would be shifted labially.

**Fig. 7**: The probing depth of the gingival sulcus around the maxillary left central incisor was 3 mm.

**Fig. 8**: The probing depth of the gingival sulcus around the maxillary right central incisor was 1 mm.

**Fig. 9**: Frontal view of the pre-op model.

Shaping the soft-tissue contour around implants with provisional resin crowns after implant placement has become a frequently used technique in implant dentistry. For most implant-supported restorations, there is a 3 to 4 mm transmucosal attachment surrounding both the implant and the restoration. Therefore, adjusting the soft-tissue contour by modifying the emergence profile of the provisional crowns to optimise the aesthetic outcome has become a regular practice in implant dentistry.

In consideration of the health of periodontal tissue around natural teeth, the location of the crown margin is preferably placed supragingivally or flush with the gingival margin so that the contour of the restoration will not influence the gingival contour. However, in the case of covering the original colour of the abutment tooth, forming the ferrule, and/or improving retention and resistance form, the crown margin can be placed subgingivally. Because the sulcular depth around a healthy natural tooth is around 1 mm, the cervical margin of the crown is usually located 0.5 mm below the free gingival margin. Thus, unlike an implant-supported crown, a tooth-supported crown can hardly influence the gingival contour.

However, when the sulcular depth of the abutment is sufficiently deep, as with a thick gingival biotype, it is possible to sculpt the gingival contour around the abutment teeth using provisional resin crowns. The treatment process will be demonstrated in this article through a typical case with a seven-year retrospective review.

**Case report**

A 48-year-old female patient whose general health condition was good, was referred to the Peking University Hospital of Stomatology in Beijing in China in 2008. The patient’s main concern was the restoration of her maxillary anterior teeth that had been compromised by severe dental caries and treated with root canal therapy.
The patient had no discomfort and desired not only restoration of the defective anterior teeth but also an aesthetic outcome. However, financial limitations meant not all of her dental problems could be addressed.

The dental examination revealed that tooth #22 was missing and tooth #23 had shifted mesially. In addition, there were visible defects on teeth #21, 11 and 12. The roots of teeth #21 and 12 were apparently palatally inclined and so were the crowns. Tooth #11 was slightly inclined to the palatal side and so was the crown. During examination of the occlusion, a deep overbite and a large overjet of the anterior teeth became evident. In addition, the contour of the patient's gingival line was inharmonious. The angle of her mouth was asymmetrical when she smiled (Figs. 1–4).

**Treatment plan**

For patients with malocclusion and misalignment of teeth, the restorative procedures should be performed once the primary orthodontic treatment has been completed. However, considering the length of treatment and her financial limitations, the patient refused orthodontic treatment and only accepted the restorative treatment. Since the patient's inharmonious gingival line may have interfered with the final aesthetic outcome, certain methods to improve the gingival contour were considered before tooth preparation.

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**Fig. 10:** The gingival contour was marked on the model.
**Fig. 11:** The gingival contour was modified on the model.
**Fig. 12:** The diagnostic wax-up showing the upward-shifted gingival contour.
**Fig. 13:** Occlusal view of the diagnostic model.
**Fig. 14:** The diagnostic wax-up showing the labially shifted restorations.
**Figs. 15 & 16:** The tooth preparation was guided by the silicone index.
**Fig. 17:** The completed tooth preparation.
**Fig. 18:** The provisional restorations replicated from the diagnostic wax-up.
Crown lengthening has been widely used for improving the contour of the gingival line. However, even if the contour of the gingival line could be modified through periodontal surgery from the vertical direction, the palatally inclined maxillary anterior teeth would cause the inclination of the teeth's long axes in the sagittal direction. Therefore, the ideal aesthetic outcome would be difficult to achieve (Fig. 5). In this case, the restoration's entire labial face needed to be shifted labially so that the height of the gingival contour could be improved (Fig. 6). Therefore, a more suitable treatment option was considered.

During further examination, we found that the patient had a thick gingival biotype with a 3 mm deep gingival sulcus around the maxillary right lateral incisor and maxillary left central incisor and 1 mm deep around the maxillary right central incisor (Figs. 7 & 8). In implant dentistry, when the soft tissue around the implant is of a thick biotype, modifying the contour of the soft tissue by shaping the transmucosal soft tissue with a provisional resin crown of a certain shape has been proved to be an effective method for improving the aesthetic outcome. However, for restoring defective natural teeth, there is insufficient clinical evidence to prove whether provisional resin crowns are capable of shaping the gingival contour. Such a treatment protocol was deemed worth attempting in the current case.

**Diagnostic wax-up**

In order to preview the expected outcome and guide the treatment, a diagnostic wax-up was prepared. On the model, the incisal edges of both central incisors were located on the palatal side of the red line (wet-dry border) of the lower lip; hence, the position of the incisal edges was to be shifted 2 mm to the labial side. Furthermore, in order to improve the patient's deep overbite and large overjet, we decided to shift the incisal edges of the maxillary central incisors by 2 mm in the vertical direction, where the lip–teeth relationship could still tolerate changes palatally. According to the varied gingival sulcular depth, in order to protect the connective epithelium of the gingival sulcus, the top of the gingival line of the maxillary right lateral incisor, maxillary left central incisor and maxillary right central incisor would be shifted in the apical direction by 2.5 mm, 0.7 mm and 2.5 mm, respectively. The entire restoration would be inclined to the labial side by 1.5 to 2 mm so that the palatally inclined roots would not interfere with the aesthetic outcome (Figs. 9–14).
Tooth preparation and provisional restoration

According to the diagnostic wax-up, two silicone indices were fabricated. One of the indices was cut in the labiolingual direction to guide the preparation of the abutment teeth. The margin of the prostheses was designed to be placed 0.5 mm subgingivally (Figs. 15–17). The provisional restorations would be fabricated according to the other silicone index, in which the improvement of the aesthetic outcome could be observed clearly. However, the shape of the provisional restorations was not designed to emulate the erupted natural teeth, but for the cervical part of the restorations to cover the labial gingiva. After a long period of remodelling and reshaping, the form of erupted natural teeth would be established (Figs. 22 & 23). The impressions for the post and cores were taken at the same time. Because the restorations were labially inclined, a gold alloy post and cores was chosen.

Shaping the gingival contour

The patient attended a follow-up two weeks after placement of the provisional restorations. At that time, the intra-oral examination showed recession of the gingiva and exposure of the shoulders on the labial side of both tooth #21 and tooth #12 (Fig. 24). The margins of tooth #11 could also be observed and the gingiva was healthy. At this appointment, the post and cores were placed and further tooth preparation was carried out to shift the margins in the apical direction. The new provisional restorations were fabricated to increase the convexity of the cervical part in order to enhance the effect of the gingival contour shaping. In accordance with the patient’s wishes, the incisal edges of the crowns were extended slightly by about 1 mm (Figs. 25–27).

After another two weeks, the patient returned to our clinic and examination found that the gingival contour had changed noticeably and the reconstruction of the transmucosal gingival contour was almost complete. The gingiva around the restorations was healthy (Fig. 28). The transgingival parts of the restorations were modified and the incisal edges were shortened in keeping with the patient’s wishes.

Two weeks after the new provisional crowns had been placed, the patient returned to our clinic for further treatment. At that time, the patient expressed her satisfaction with both the gingival contour and the position of the incisal edges (Fig. 29). Once the provisional crowns had been removed, the gingival contour was closely matched to the gingival collars on the model.
Shaping the gingival contour

Around the abutment teeth was similar to the soft-tissue collar around dental implants. The final impression was taken in order to fabricate the master model, which would replicate the gingival contour accurately (Figs. 30–32). The final all-ceramic restorations were fabricated according to the master model.

Completing the final restorations

Once the final restorations had been completed, the clear transgingival contours of the crowns could be seen and were consistent with the shape of the gingival collars around the abutment teeth on the master model (Figs. 33–35). During the try-in procedure, the marginal fit, the shape and the contact points, the consistency of the transgingival contours of the restorations and gingival collars around the abutment teeth were examined carefully. The transgingival contours of the restorations should maintain the shape of the gingiva, but not increase the pressure, allowing the gingiva to remain healthy and maintaining the contour in the long term (Figs. 36–39).

Discussion

Shaping the transmucosal contour around implants using provisional crowns has been frequently used in implant dentistry. By using an individualised transfer coping, the collar-like soft-tissue contour around an implant can be replicated on the working model accurately. In this manner, the contour of the final restoration will fit the exact contour of the soft tissue, thus assuring the long-term stability of the shape and position of the soft tissue around the implant.

In this case, the treatment protocol was drawn from the experience of the restorative process of implant-supported crowns. Taking advantage of the relatively deep gingival sulcus and thick biotype, the gingival contours around the abutment teeth were modified by the provisional restorations; therefore, the gingival contour was reshaped in 3-D and the ideal aesthetic outcome was achieved.

Throughout the relatively long-term follow-up period, the gingiva around the maxillary right lateral incisor and left central incisor with their larger transgingival depth and convexity was quite stable. The stability of the gingiva around these two teeth was greater than around the maxillary right central incisor with its relatively shallow transgingival depth and smaller convexity. In addition, the gingiva was healthy, proving the effectiveness of the treatment protocol applied.

Revisits

The one-week follow-up after placement of the final restorations found that the gingiva was healthy and stable around the crowns. When compared with the preoperative intra-oral photographs, the aesthetic outcome was a significant improvement (Figs. 1, 3, 40–43).

The patient unfortunately did not attend the remainder of the follow-ups until seven years after placement of the final restoration. At this appointment, the examination revealed an undesirable oral health status, with a Debris Index (+) and Dental Calculus Index (++)

Fig. 37: The final restoration seated on the maxillary anterior dental arch.
Fig. 38: Left lateral view of the patient’s smile after placement of the restoration.
Fig. 39: Right lateral view of the patient’s smile after placement of the restoration.
Fig. 40: One-week post-op photograph of the maxillary anterior teeth.
Fig. 41: Frontal view of the patient’s smile after treatment.
Fig. 42: One-week post-op photograph of the left lateral view of the patient’s smile.
In this case, the treatment protocol lay between the concept of the biologically oriented preparation technique (BOPT) and biological tissue adaptation (BTA), both of which have gained gradual acceptance. The BOPT approach suggests modification of the gingival contour by provisional restorations. Once the ideal gingival contour has been achieved, the gingival contour is replicated to the final restorations precisely. The BOPT approach suggests finishing the tooth preparation without a defined shoulder so that the gingival margin can be modified freely. In the present case, the maxillary right lateral incisor and maxillary left central incisor were prepared without a defined shoulder, thus fulfilling BOPT’s requirements for tooth preparation. However, for BOPT, the convexity of the final restoration should be similar to that of the natural teeth and could play a role in remodelling the cemento-enamel junction. For the present case, the convexity of the final restorations was greater than that of the natural teeth and in that manner the current treatment protocol differed from BOPT.

The BTA protocol suggests cutting and modifying the gingiva in order to achieve an ideal gingival contour, and thereafter fabricating provisional restorations with a larger cervical convexity to remodel the gingiva. Once the gingival contour is stable and meets the requirement, the final restoration with the same transgingival contour is placed to maintain the gingival contour.

According to the BTA approach, cutting part of the gingiva directly may damage the biologic width; thus, the gingiva is stimulated to regrow. However, the larger labial cervical convexity of the provisional or final restoration will interfere with the regeneration of gingiva in the vertical direction. The gingiva will only be able to regenerate along the contour of the restorations, and thus a gingival sulcus with a sealing function will develop and the gingival contour will be consistent with the shape of the restorations.

In the BTA approach, the gingival–alveolar relationships are defined as 3-D biologic widths and the relationship between the gingival contour and restorations is deemed to be a stable relationship. In the present case, the treatment protocol differed from BTA; however, the outcome of the final restorations was similar.

Both BOPT and BTA are creative aesthetic gingival treatment concepts that have been established in recent years. The protocol applied in the current study lay somewhere between these two approaches. After seven years of follow-up, the maxillary right lateral incisor and maxillary left central incisor demonstrated better final aesthetic outcomes compared with the maxillary right central incisor, for which the restorative procedure was close to conventional restoration. Such a result encourages some consideration.

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

about

Dr Feng Liu is a Clinic Professor and Vice Director of Clinical Division of Peking University School and Hospital of Stomatolgy. He is also the director of the Clinical Division Esthetic Dentistry Training Center.
Utilising smile design software and CAD/CAM for creating a mock-up and final restorations

Author: Aki Lindén, Finland

Summary

Patient

A 32-year-old woman with hypoplastic pitted amelogenesis imperfecta.

Treatment plan

Patient photos and smile design software were used for treatment planning and creating a digital mock-up. A digital impression was captured with an intraoral scanner. A digital mock-up design was used in CAD software for designing a wax-up. After preparations, a digital impression was taken again; the final veneers were designed with CAD software and created with a milling unit.

Introduction

Treatment planning and smile designing have been performed with traditional techniques for years in aesthetic dentistry. In recent years, various software programmes have emerged to offer useful new tools for digital designing. When compared to traditional techniques, the main advantages of digital designing lie in speed, flexibility and improved communication between the patient and the treatment team.
Digital smile designing

During the first patient visit, preoperative face photos were taken with a Canon EOS 6D camera (Fig. 1). Two photos were taken of the patient—one face photo of a smile (Fig. 2) and one retractor image (Fig. 3).

The photos were both carefully taken from the same angle using a camera stand. The distal distance between the maxillary central incisors was measured with a caliper for the calibration of the image.

The appropriate shade for the new teeth was also determined (BL3—Fig. 4, the third colour from the left).

Next, the patient's smile photo was imported into a smile design software programme. The patient's facial proportions were analysed—including the smile line, central line and papillary line (Fig. 5).

The different treatment possibilities were explained to the patient visually with help of the software's silhouette tool (Fig. 6). The patient was able to take part in the treatment planning process by visually expressing their expectations of the final result (Fig. 7). Ultimately, the decision was made to treat eight anterior maxillary teeth instead of the initially planned six, as the patient's wide smile revealed more teeth than average. The more comprehensive treatment was also better in line with the patient's expectation of the result (Fig. 8).

To finalise the design, the patient's retractor image was superimposed on top of the smile image, which enabled viewing and modifying the gingival area (Fig. 9).

Creating wax-up

A digital impression of the patient's pre-op dentition was taken using an
intraoral scanner (Figs. 10 & 11). Both the upper and lower arches were scanned and the digital impressions were immediately available for wax-up designing.

The smile design silhouette was exported from the smile design software to the CAD software for wax-up designing (Fig. 12). The silhouette was adjusted on top of the digital impression and used as a guideline for creating veneer designs in the software. The tools in the CAD software were used to design and finalise the digital wax-up (Fig. 13).

Next, the digital wax-up was 3-D printed for mock-up creation. A silicone key was prepared from the 3-D printed model. Using the silicon key and the 3M ESPE Protemp 4 Temporisation Material, a mock-up was created into the patient’s mouth (Fig. 14), with its fit and functionality checked. At this point, the patient had the opportunity to experience the design of her new teeth and understand the altered feel and look (Fig. 15).

Preparations and temporary veneers

After confirming the proper fit, the patient’s teeth were prepared (Figs. 16 & 17) and the preparations were scanned, again using an intraoral scanner. Next, temporary veneers were created with the same silicon key and 3D ESPE Protemp 4 Temporisation Material. The temporary veneers were tried on the patient and fixed by spot-etching.
Creating final restorations

Once the temporary veneers had been successfully fitted, the final veneers were created from IPS e.max CAD blocks using a milling unit. The restorations were finished by layering ceramics (e.max Ceram) to the labial and incisal parts for maximum aesthetics (Fig. 18).

To conclude a successful treatment process, the final restorations were cemented. A photo of the end result was also taken (Figs. 19 & 20).

Conclusion

Digital smile designing significantly improves the communication between the patient and the entire treatment team. More predictable results make patients more confident, as they can trust that the outcome will be in accordance with their expectations. Patients are also pleased to be actively involved in their own treatment and that they are able to take part in the design process right from the start. As a result, patient case acceptance is improved.

Digital smile designing provides several benefits compared to the traditional way of smile designing with different wax-ups—it is easier, more comfortable for the patient and more time-efficient.

Acknowledgment: The author would like to thank Dr Katja Narva, DDS, PhD, Specialist in Prosthodontics.

Utilised equipment and software: Planmeca Romexis Smile Design software, Planmeca PlanCAD Premium software, Planmeca PlanScan intraoral scanner, Planmeca PlanMill 50 milling unit.

about

Aki Lindén, CDT has an extensive history in aesthetic dentistry and fixed prosthetics, as he has worked in his own dental laboratory in Helsinki for over 20 years. Lindén is a recognised Opinion Leader for Ivoclar Vivadent in Finland, for which he regularly serves as an instructor and lecturer. Mr. Lindén is also a member of several aesthetic dentistry societies, such as the Scandinavian Academy of Esthetic Dentistry (SAED), the American Academy of Cosmetic Dentistry (AACD), and the Society for Color and Appearance in Dentistry (SCAD).
Conservative smile design for the general dentist

Author: Dr Rami Chayah, Lebanon

Abstract

This article discusses the advantages of short-term anterior tooth alignment using the Inman Aligner system, particularly for general dentists. The article will give a brief description of the Inman Aligner appliance and its use in short-term orthodontics, and it will answer three major questions the general dentist should ask himself or herself during the treatment planning process. In support of this treatment modality, three case scenarios general dentists see daily will be given as examples.

Introduction

General dentists face the daily challenge of performing instant veneers for patients with misaligned anterior teeth who refuse orthodontic treatment, many of whom regard fixed orthodontic treatment as too long a commitment for achieving their desired aesthetic results. In today’s fast-paced life, some patients are not prepared to wait or to go through long treatments. One of the greatest benefits of short-term anterior alignment is that many people who would refuse comprehensive orthodontic treatment may accept short-term removable alignment techniques such as the Inman Aligner system.

The Inman Aligner is a simple removable appliance, a modification of the removable spring retainer. It uses super-elastic coil springs to apply highly efficient light and consistent forces on both the labial and lingual surfaces of the anterior teeth (Figs. 1 & 2). The appliance is fabricated on a cast on which, based on a surgical model, the anterior teeth needing correction have been removed and reset in the ideal position in wax on the working cast. When the patient wears the appliance, the built-in forces generated by the spring coils will correct the misaligned anterior teeth (Fig. 3).

What distinguishes the Inman Aligner appliance from other short-term orthodontic systems such as Invisalign (Align Technology) and Six Month Smiles is its low cost, low risk and short learning curve for general practitioners. Only one appliance is used from the start to the end of the treatment. Sometimes, several clear aligners may be used to de-rotate resistant canines. The system is well received by patients because...
Inman Aligner appliance case report

Fig. 10: Left side view of the maxillary teeth before ABB.
Fig. 11: Left side view of the maxillary teeth after alignment and bleaching.
Fig. 12: Full face before treatment.
Fig. 13: Full face after treatment.
Fig. 14: Frontal view showing the patient's natural smile before treatment.
Fig. 15: Frontal view showing the patient's natural smile after treatment.
Fig. 16: Full face showing the patient's natural smile before treatment.
Fig. 17: Full face showing the patient's natural smile after treatment.
Fig. 18: Occlusal view showing the maxillary arch before treatment.
Fig. 19: Occlusal view showing the maxillary arch after treatment.

it is fast and relatively cheap. It also accommodates today’s active lifestyle. Usually, most cases take from six to 16 weeks. Patients can take the appliance out during meals or work meetings.

As with any other treatment techniques, the Inman Aligner has its limitations. Hence, case selection is imperative, as the Inman Aligner is not suitable for posterior orthodontic treatment or Class II or III treatment. Only certain types of movements are possible and some patients will still need conventional orthodontic treatment or indirect restorations. Certain criteria should be met before treatment proceeds. At consultation, other orthodontic alternatives should be offered. The dentist must quote for the long-term retention maintenance and should look for any skeletal discrepancies. Compromises must be signed off.

Treatment concept and case presentation

Dentists need to consider three questions about treatment during the treatment planning process. The first question: can the patient’s teeth be fixed without orthodontic treatment in a very short period? In order for the general dentist to answer this question, he or she should first establish whether the patient does not wish to pursue orthodontic treatment because of the time commitment and cost. Would he or she also refuse short-term anterior tooth alignment? Would the occlusion be improved even though a Class I molar or Class I canine relationship may not be achieved? Patients may prefer short-term alignment techniques because of the shorter treatment time and the lower cost.

Case 1

The first case presented is a good example of a scenario relevant to the question above. The patient was a young woman at college who presented at my office requesting a full smile makeover of 20 veneers; she desired a “Hollywood smile” as expressed in her own words. Her complaint was the retracted maxillary right and left central incisors, the incisal edge wear on the maxillary central incisors and mandibular anterior teeth, the pointy shape of the maxillary and
mandibular canines, and the yellow colour of her teeth overall (Figs. 4 & 5). It could be argued that it would be highly unethical to prepare the sound enamel, transforming her ten maxillary teeth into stumps, for the rest of her life, especially at this young age. After long discussion and explanation of the disadvantages of the shortcut route of preparing her teeth for ceramic veneers, this option was excluded. Several other options were available and discussed with her, but because she wanted a smile enhancement in a short period of time, conventional fixed orthodontic treatment was also excluded. After checking her bite, it was observed that there was insufficient interocclusal space to shift the maxillary central incisors forwards without opening the bite. However, the patient accepted use of the Inman Aligner system owing to its short treatment time and flexibility regarding being able to take the appliance off during the day while eating.

The treatment plan was to follow the ABB protocol (alignment, bleaching and bonding). This concept still constitutes a smile makeover but in a very conservative manner. Taking into consideration her age and her sound enamel tissue, this was agreed to be the most progressive means of carrying out her smile enhancement. First, her maxillary teeth were aligned using the Inman Aligner with an expander for nine weeks. Two extra-clear aligners were used in the last two weeks of treatment to de-rotate the maxillary left lateral. Once the maxillary teeth had been aligned and in the last two weeks of treatment, the teeth were bleached with custom-fitted super-sealed trays (Fig. 6). Now that the teeth had been straightened and whitened, the patient became more aware of the differential wear on the incisal edges of her anterior maxillary and mandibular teeth. Incisal edge bonding using composite was completed using a simple direct technique. The patient was very happy with the final result (Figs. 7–19).

Case 2

The second question to be considered regarding treatment: would some of the teeth be aggressively prepared or end up with root canal treatment if treated with restorative dentistry without alignment and would the overall outcome be better with alignment rather than without? This question addresses the ethical dilemma general dentists face every day. We often have cases with overlapping anterior central incisors in our office.

The patient presented in this case was bothered by the look of his overlapping maxillary central incisors (Figs. 20 & 21). His mandibular teeth were also crowded, but for some reason, his concern was only with his maxillary teeth. He had started to hide his smile in front of his friends, feeling embarrassed to show his maxillary teeth. After the full orthodontic examination and discussion about all of the treatment options, including comprehensive orthodontic treatment, the patient chose the removable Inman Aligner system owing to its flexibility in that the wearer is able to remove the appliance for several hours a day and because of its short treatment time. The maxillary left central incisor would have been aggressively prepared...
had it been treated restoratively. By using a simple anterior alignment technique, the treatment took only eight weeks to straighten the teeth and a great deal of sound enamel tissue was preserved by conservatively resolving the unattractive appearance of the maxillary teeth (Figs. 22 & 23).

Case 3

The third question to be considered: will the teeth require restorative work anyway, even after alignment?

The case presented serves to demonstrate the necessity of aligning the teeth even before placing ceramic veneers. The patient in this case exhibited moderate misalignment with major anterior edge wear due to occlusal trauma. In addition, the teeth were darkened through years of stains being absorbed through the worn dentine of the incisal edges (Fig. 25). The patient initially requested instant veneers to resolve his smile problem, but after mocking up the design directly in his mouth, he was discouraged from pursuing this option owing the amount of tissue that would be lost. The aggressive preparation of the tissue was explained to him using the occlusal image of his maxillary teeth. After an extensive orthodontic examination and discussion of the options, the patient refused fixed orthodontic treatment, as well as clear aligners. He refused the first option because he did not want anything fixed in his mouth, and he refused the second option because of the proposed time involved. The Inman Aligner system was introduced to the patient, and he quickly accepted this option owing to the short treatment time and removability.

The treatment plan was to align the teeth first and then to reassess the restorative work needed (Fig. 26). The appliance was used for 12 weeks and only worn for 16 to 18 hours a day. During the last three weeks of alignment, the patient began to bleach his teeth. By week 12, the teeth were straight and white (Fig. 27). At this point, a direct mock-up was done to show the patient the smile design that could be achieved with composite. He felt that the teeth were still flat and wanted a fuller smile. Because we had aligned the teeth, only minimal preparation was needed as evident from the wax-up and the decision was made to fabricate ceramic veneers instead (Fig. 28). This case shows that for complex situations and considering patients' high aesthetic demands, pre-alignment is essential to produce minimally invasive veneers with minimal enamel loss. This clinical approach guarantees that the strength of bonding to the enamel is much greater.

Conclusion

The goal of this article is to encourage general dentists to reflect on the importance of considering short-term tooth alignment alone or in conjunction with restorative dentistry when treating patients. Hopefully, these three questions and cases will prompt readers in thinking through the process of this treatment modality.

Disclosure: Dr Chayah is the trainer for Inman Aligner Training in the Middle East. He provides hands-on full-day certificate courses to general practitioners.

Acknowledgement: I wish to thank Dr Tif Qureshi, the founder and Director of Inman Aligner Training in London, for his mentoring and sharing the last case in this article.

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

contact

Dr Rami Chayah runs a cosmetic dental practice in Lebanon with an emphasis on minimally invasive dentistry. He seeks to share his passion for photographic and video production and believes that through his personalised dental approach, he can demonstrate a more positive way of practising dentistry, helping other dentists to view the dental domain in a different way.

You can reach Dr Chayah through his social media links: www.facebook.com/ramichayah and http://instagram.com/ramichayah

www.inmanalignertraining.com
The European Aligner Society is an international organisation established in 2013 that aims to promote education and research in aligner therapy. Trained in South Africa and with 22 years of clinical experience, Dr Graham Gardner has been running his own private practices in the UK since 2008. In an interview with Dental Tribune International, the EAS President shares his ideas and views about the importance of aligners in orthodontics and about the EAS, which he believes will become the society for aligner therapy.

DTI: Dr Gardner, you have been working with aligners for more than a decade now. What convinced you initially of this treatment method and what are the main advantages in your experience?

Dr Graham Gardner: From the beginning of my career in the early 1990s, a time when ceramic brackets and lingual braces became available, I was certainly aware of the fact that aesthetic appliances were going to be the future of orthodontics.

In 2001, I was fortunate to attend a certification course for Invisalign, which was truly a watershed moment in my orthodontic career because I saw the value and potential of aligner therapy for both dental professionals and patients. In my opinion, aligner therapy opened the door for a huge cohort of patients who would not have considered orthodontic therapy in the past mainly owing to aesthetic concerns. In addition to aesthetic benefits, aligners are far more comfortable than fixed appliances, as they are removable and hence facilitate oral hygiene during therapy.

They also move the teeth more gently with less pressure, which is favourable with regard to patient comfort and from a biological perspective too.

Today, I treat over 75 per cent of patients with Invisalign in my practices.

In recent years, clear aligners have become a favourable treatment alternative to fixed appliances, and the global orthodontic supplies market is expected to reach about US$3.9 billion (€3.6 billion) by 2020. In your professional opinion, how will this market develop in the near future?

Over the past decade, aligners have become mainstream orthodontics and I definitely see this trend continuing and expanding.

With the technological advancements, including 3-D and CAD/CAM, that allow the clinician to diag-
...the advancements we are now seeing in Europe will match those in America and Asia...

nose, plan the treatment and confirm biomechanics in a far more in-depth way than ever before, orthodontics is now catching up with the high-tech world we live in—it is twenty-first-century orthodontics.

When aligners were first introduced to the market, there were some limitations and we could only treat mild malocclusions. However, aligner therapy has come of age and is now a genuine appliance system with which we can treat the majority of malocclusions.

At the moment, however, aligner therapy is still a fairly expensive form of orthodontics. Thus, I hope that improvements in materials and 3-D printing will render manufacture and the product itself more cost-effective. For example, 3-D printers could allow individual practices to print their own aligners in the future.

Overall, with technological advancements and increasing patient acceptance, we will be able to treat pretty much everything in the future in my view.

How have developments in the European and the overseas market differed?

Dentistry as a profession is very conservative and dentists in the US, for example, are perhaps a bit more progressive. However, with regard to aligners, I no longer really see a great difference between Europe and America. The movement is global and I suspect the advancements we are now seeing in Europe will match those in America and Asia, where
Aligner therapy is also very popular. There are always regional differences, also partly related to legal restrictions, but the trend towards aligner therapy is a global phenomenon.

How does the EAS address the current trends in orthodontics?

Aligner therapy has seen huge advancements over the past decade, with an increasing number of manufacturers offering different systems today.

The work of the EAS is characterised by three cornerstones. The first is education, namely arranging conferences and regional meetings and introducing clinical online forums, through which members can interact and share experiences and ideas. The second column of the EAS’s philosophy is communication. We aim to be a neutral organisation that patients can turn to for comprehensive information about aligner therapy and that members can consult for guidelines. Research is our third column, which is currently lagging behind. Eventually, we hope to have our own aligner journal or magazine and grant annual awards for excellence in aligner therapy.

With the help of our sponsors, the EAS will grow and become an international umbrella organisation to help promote education and research and development for aligner therapy.

The EAS is a fairly young organisation and hosted its first congress on 13 and 14 February in Vienna. What was the idea behind this event?

Thus, the main motivation behind the foundation of the EAS was to establish a neutral body—an international society that is independent of any aligner company and open to all dentists using aligners for orthodontic treatment.

The EAS’s primary objective is education because, obviously, education underpins every profession and without it we simply stagnate. Therefore, we decided that our first event should be a congress held in the heart of Europe offering a broad spectrum of informative lectures and a showcase of different systems and products. At the first congress in Vienna, internationally distinguished speakers shared their views and expertise about aligner therapy. Moreover, the event offered manufacturers an independent forum for exhibiting their solutions.

Can dental professionals look forward to another EAS congress next year?

...aligner therapy opened the door for a huge cohort of patients who would not have considered orthodontic therapy in the past...

Based on the success of the inaugural event over the past weekend, we definitely want the congress to become a regular event in the calendar. While we are planning to hold the EAS congress every two years, we will be organising smaller regional forums on a continuous basis throughout every year.

Thank you very much for the interview.
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**Light and the biological clock**

*Author: Antonín Fuksa, Czech Republic*

**Introduction**

Temporal rhythms can be found throughout the whole natural world. The circadian (from Latin circa—around, diem—day) have been discussed in the magazine *Svetlo* (Czech lighting journal) several times in a past few years. The expression ‘circadian’ was introduced in the 1950s by Franz Halberg, one of the founders of chronobiology, the science of temporal order in the living realm. From Czech chronobiologists, Prof Helena Illnerová and her team are the most well-known for the discovery of melatonin secretion variation in rats, which depends on light exposure changes over the four seasons, as well as for the discovery of photosensitivity in the biological clock in suprachiasmatic nuclei in hypothalamus.1,2

In the autonomous nervous system of mammals, the central biological clock is found under the crossing of optical nerves in the suprachiasmatic nuclei (SCN), which controls hormone levels in blood, body temperature, sleep and alertness, to name just a few. Melatonin is the hormone governing sleep and body regeneration, while cortisone is the hormone connected with activity, stress and motion. Examples of levels observed, courtesy of Philips Lighting, are shown in Fig. 1.3 The patterns of the curves vary slightly each day.

The central biological clock is synchronised by light, but food intake also matters. In young humans, this clock has a circa of 24 hours when running free of light synchronisation, which is the origin of the term ‘circadian’. Individual organs have their local clock synchronised with the SCN ‘master’ clock. Light is the strongest synchronising agent (Zeitgeber). A dose of several lux of suitable spectral distribution for several minutes can already cause level of melatonin in blood to decrease.

**Effects of light on living organisms**

Prof. Fritz Hollwich, an author of an ophthalmology textbook and inventor of many procedures in ophthalmology, has studied these effects closely. In his inaugural dissertation from 1948, he distinguishes the visual and energetic (non-visual) function of the eye. He found that patients suffering blindness due to cataracts had different levels of certain hormones and other markers in the blood, compared to the normally sighted population. When the patients regained their sight after an operation, the levels returned to normal. He also found that some distributions of light, lack of light or excess light or its invariance have adverse effects on organisms. In the last few years, a novel photoreceptor—intrinsic photosensitive retinal ganglion cells (ipRGCs) is often discussed. These had already been found in mice back in 1991 and in humans as late as 2007. ipRGCs contain melanopsin photo pigment, which maximum sensitivity is reported between 450–482 nm (rarely
also between 420 nm and 491 nm. These cells project the synchronisation event to the central biological clock, they also play a part in the pupil reflex and they may also contribute to the visual sensation. They are spread all over the retina, but are more numerous in its lower part.

They are called the circadian sensor or blue-sky sensor for their high sensitivity to blue and spatial distribution on the retina. The latest research\(^1\) shows that the synchronisation signal is also assisted by the cones, and the exposition time also plays an important part. The effects of two narrowband lights with wavelengths of 460 nm and 555 nm were compared: their initial effect on melatonin decrease was almost the same, however, in the case of the green light, the effect ceased after about 90 minutes, while the blue light effect persisted. \(C_r(\lambda)\) hence shows the long-term sensitivity while the \(C_c(\lambda)\) takes the short-term effects into account. Two effects are observed: melatonin level decrease and phase-shift of the central biological clock.

Figueiro and Hubalek described the construction of a circadian dosimeter (Daysimeter, LuxBlick).\(^5\) It is a small instrument that is worn like spectacles. Two photodiodes are used as sensors, one corrected by a filter to \(V(\lambda)\) and the second to \(C(\lambda)\). Measured values are stored along with timestamps in intervals of tens of seconds. Analysis of the data can show whether the user gets a sufficient dose of the light affecting the nervous system and whether or not he/she is disturbed by light at night. Critical points can be localised in time so a remedy may be suggested. Data from additional sensors like an accelerometer or a thermometer can make interpretation of the light data easier.

Decreasing of the melatonin level in the morning and keeping it low during the day is naturally beneficial as it starts a number of processes that lead to higher alertness, activity and concentration. Light sources of higher chromatic temperature can provide spectrum rich in the circadian-efficient band. According to the Kruthoff curve, we can expect the users to require higher levels of light in their place of work, which can be also aided by local luminaries. Higher illuminance and higher chromatic temperature can have tangible economic outputs in the workplace thanks to a better quality of workmanship, lowering stress, better use of work time or lowering sick leave. Melatonin is a hormone of sleep and regeneration of the organisms. It scavenges free radicals and kills cancer cells in the body. So it is most beneficial to let it do its job undisturbed during the night. The means for lowering disturbing night light include a more sophisticated design of street lamps, curtains, window blinds, shutters or red night light.

White LEDs are mostly blue LEDs with a phosphor that converts part of the blue light into wideband yellow, which then mixes with blue, making white. This introduces a risk of disturbing the darkness at night by LED streetlights. Blue light gets far more scattered in the atmosphere than the longer wavelengths, so disturbing scattered light should also be considered. According to the International Dark-Sky Association (IDA), LEDs with a low chromatic temperature (2,600 K) are suitable for street lighting.\(^3\) However, even in this case, the portion of circadian-efficient light is three to four times higher than in the more commonly used high-pressure sodium lamps (see Table 1, page 30).

Calculation and measurement

Circadian values were introduced in parallel with photometric values by Gall and Lapuente.\(^6\) Function \(V(\lambda)\) is replaced with \(C(\lambda)\) and index \(c\) is used with the values. In this way, we can consider ‘circadian illuminance’ for example. Circadian illuminance can be measured with a luxmeter corrected to circadian efficiency \(C(\lambda)\). For coarse relative measurements, a Lee 120 gel filter can be used. Another option is calculation from the spectrum or establishing a factor for converting ‘photopic luminous’ to ‘circadian luminous’ for a given light source. A factor of circadian efficiency \(a_{cv}\) (Zirkadanalyer Wirkungs faktor in German) is introduced.\(^10\) This is calculated for light of relative spectral distribution of power according to Equation 1.

\[
 a_{cv} \{X(\lambda)\} = \frac{K_m \int_{380}^{780} X(\lambda) C(\lambda) d\lambda}{K_m \int_{380}^{780} X(\lambda) V(\lambda) d\lambda}
\]

\(a_{cv}\) is a factor for converting photometric values into circadian values for a given light source. It can be used to compare different lights or light sources from the perspective of their effect on our nervous system.

The shape of the curve \(C(\lambda)\) and the area under it are not exactly known yet. This is why another factor can be introduced to allow a comparison of the results calculated with the presently known shape of \(C(\lambda)\) and those based on an updated \(C(\lambda)\) in future. The factor can be defined in different ways, for example the equality of areas under \(C(\lambda)\) and under \(V(\lambda)\) or by the equality of luminous and circadian flux for CIE A incandescent bulb model.\(^10\) The option proposed here for discussion is Circadian Activation Index \(A_c\) (CAI). Its value is
A \textsubscript{c} makes it easy to compare the impact of different lights on the nervous system. It has a value of 100 for the reference D65 daylight. Values for some common light sources and black body temperatures are tabulated in Table 1. Besides the daily rhythms, physiological rhythms of high/low tide, weekly rhythms, lunar and annual rhythms are known.

Lack of light during winter contributes to sleepiness and the need for longer sleep, but also to seasonal affective disorder (SAD), known as the winter blues. This can be treated by bright light therapy (phototherapy); 10,000 lux at eye level for 30 minutes is a proven efficient dose.\textsuperscript{11} For personal application, sunshine simulators are used. In contrast to industrial luminares with white or blue LEDs are also available on the market. Less known are light visors with embedded LEDs for illuminating the eyes. These aids can ease the start of a new day, but for a permanent effect, lighting with sufficient circadian effect is needed all day long.

Table 1: Examples of A \textsubscript{c} values.

<table>
<thead>
<tr>
<th>Light source</th>
<th>Specification</th>
<th>A \textsubscript{c} (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daylight</td>
<td>D65</td>
<td>100</td>
</tr>
<tr>
<td>Black body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,700 K</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>4,000 K</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>5,000 K</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>6,500 K</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>8,000 K</td>
<td>116</td>
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</tr>
<tr>
<td>20,000 K</td>
<td>156</td>
<td></td>
</tr>
<tr>
<td>100,000 K</td>
<td>181</td>
<td></td>
</tr>
<tr>
<td>Fluorescent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm white 827</td>
<td>2,700 K</td>
<td>27</td>
</tr>
<tr>
<td>Cool white 840</td>
<td>4,000 K</td>
<td>55</td>
</tr>
<tr>
<td>Daylight 950</td>
<td>5,000 K</td>
<td>83</td>
</tr>
<tr>
<td>Cool daylight 965</td>
<td>6,500 K</td>
<td>95 to 105</td>
</tr>
<tr>
<td>Blue</td>
<td>TL-D Blue</td>
<td>740</td>
</tr>
<tr>
<td>Incandescent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>2,800 K</td>
<td>36</td>
</tr>
<tr>
<td>Halogen</td>
<td>2,900 K</td>
<td>40</td>
</tr>
<tr>
<td>LED</td>
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<td></td>
</tr>
<tr>
<td>Warm white</td>
<td>2,850 K</td>
<td>36</td>
</tr>
<tr>
<td>Cool white</td>
<td>6,800 K</td>
<td>90</td>
</tr>
<tr>
<td>(daylight)</td>
<td>450 nm</td>
<td>875</td>
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<tr>
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<td>52</td>
</tr>
<tr>
<td>Green</td>
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<td>0.4</td>
</tr>
<tr>
<td>Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arc lamp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>High pressure</td>
<td>8 to 13</td>
</tr>
<tr>
<td>Low pressure</td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>Metal halide 942</td>
<td>4,200 K</td>
<td>69</td>
</tr>
<tr>
<td>Metal halide 965</td>
<td>6,500 K</td>
<td>100</td>
</tr>
</tbody>
</table>

Appendix

This article was first published in Czech Republic in Svetlo magazine in 2010.\textsuperscript{12} Since then, a new technical rule DIN SPEC 5031-100 has been published,\textsuperscript{13} specifying a new shape of ipRGCs sensitivity curve, now called s\textsubscript{ip} peaking at 490 nm, see Fig 2. A new term ‘melanopic’ is now preferred for non-image forming effects of light. A melanopic conversion factor m\textsubscript{mel} D65 has been defined to compare various lights with D65 daylight (A\textsubscript{c}/100 equivalent).

Dental surgery is one of the most visually demanding tasks involving high contrasts. With melanopic effects of light in mind, DentaSun ‘above-the-chair’ dental luminaires have been developed by NASLI. Better light ergonomics, improved sight performance and minimalised eye fatigue are achieved by an advanced approach in lighting based on non-visual effects, along with a lower perceived contrast and an emphasis on light uniformity.

Electric light has been known to alleviate SAD since the 1980s. Nowadays, full spectrum light is used to treat general depression and to restore sleep/wake cycle to improve all kinds of conditions including dementia or Alzheimer disease. NASLI phototherapeutic luminaires are used in bright light therapy, dawn/dusk simulation, wake therapy and programmable all-day phototherapy. Chronobiological methods of treatment received statutory healthcare funding in 2015 in the Czech Republic.

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

Antonín Fuksa graduated (MSc) in 2000 at the Czech Technical University in Prague, Faculty of Electrical Engineering in the field of study Measurement and instrumentation. He currently works as a developer of intelligent luminaires, smart lighting systems and chronobiological phototherapy devices in NASLI.
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What do our teeth betray about us?—Part II

Author: Dr Stanislav Cícha, Czech Republic

In the first part of this article series, I described the significance of individual teeth in terms of emotional and health status, considering specifically the canines. In the second part, I will focus on the premolars and molars. The first premolars represent our desires and our own self, simply described with the words "I want" (Fig. 1). The maxillary right first premolar reflects how we would like to appear on the outside and the left one represents our emotional desires.

The maxillary first premolars are among the most frequently treated teeth, with interventions ranging from fillings to endodontic treatment, crowns and extractions (Fig. 2). This does not come as a surprise, since every day we are confronted with notions perpetuated by the media regarding how we should look and what we should buy to reach this ideal. Instead of fulfilling our true emotional desires, we are urged to follow the crowd.

The mandibular right first premolar reflects the ability to realise our goals and the left premolar shows our ability to convey our feelings and wishes in our environment. With the first premolars, there arises the question of orthodontic extractions. The author of the book _Quand les dents se mettent à parler_ (When the teeth talk), Dr Michèle Caffin, mentions that extractions of first premolars weaken the sense of self, and children with extracted premolars tend to submit easily to authority figures despite not wanting to do so. I cannot confirm nor refute this, as I have only had a few patients who have undergone this treatment and was not able to observe them over a longer period.

The second premolars can be characterised by the sentence "I want to create" or the term "our creative..."
ego” (Fig. 3). The maxillary right second premolar represents our development in the outside world, our children and our hobbies, and the left second premolar our natural abilities. The mandibular right second premolar, similar to the adjacent first premolar, reflects the ability to realise our goals, particularly in our professions. After the reconstruction of anodontia using an inlay bridge, an indecisive young female patient successfully finished school to the great joy of her parents (Fig. 4). In contrast, Figures 5 & 6 are photographs of patients who always used to come second place in their career progression.

The mandibular left second premolar indicates the assimilation of the maternal energy in our lives. Lingual inclination, the persistence of primary tooth #75 and its reinclusion point to the situation in which a child does not want to or cannot mature into an adult. Behind this is often the dominant influence of the mother, similar to the case of retraction of tooth #22, which we learnt about in the first part of this article series.

Fortunately, mothers generally do not know about these effects. Thus, after successful orthodontic treatment initiated by them and the subsequent realignment of the permanent second premolar, they are very surprised by the transformation of their once-obedient child with a self-conscious personality.

The first molars (Fig. 7) are closely associated with the status that we desire both in society and in our families. Fulfilling ideals to improve our position in society is linked to the maxillary and mandibular right first molars, and they reflect our professional lives and our successes in this regard. The patient shown in Figure 8 had to leave her beloved profession owing to family circumstances. She had to move and stay at home. After having endodontic treatment performed on teeth #15 and 16, she presented with a large periapical lesion on tooth #16 several years later (Fig. 9). She probably has still not accepted her new situation.

The maxillary left first molar reflects the expression of our feelings. As this is often suppressed in our modern society, this tooth is treated very often.

The mandibular left first molar reflects our desire to be loved. This tooth is restored often and from very early on, a sad finding in this context. As an example, Figures 10a–e shows a female patient who...
broke this tooth after a failed relationship. A radiographic examination revealed that all of the other teeth remained intact.

The second molars reflect our relationships with the world around us and in particular with our closest relatives (Fig. 11). Both right second molars reveal, through their status and alignment, ordinary circumstances of daily life. Long-term recurring situations, often considered trivial in our contexts, that annoy us but that we are not able to change may manifest in these teeth.

The left second molars can show how harmonious the relationships with our family members are. I had a juvenile patient who was struggling to cope with an ongoing love triangle in his family. Endodontic treatment was indicated for his maxillary left second molar, yet the entire dentition showed hardly any tooth decay (Fig. 12). His brother, who did not have to deal with such a situation, did not have any dental problems. In this context, I would like to emphasise that teeth reflect life circumstances according to the subjective perception of the person concerned.
As dentists, third molars are usually of marginal interest to us, except for surgeons and endodontists, who can show off with perfectly filled root canals of bizarre shapes in these teeth. From a holistic perspective, however, third molars express the individual energy of a person (Fig. 13). The maxillary right third molar corresponds to our efforts to contact the material and spiritual worlds. The maxillary left third molar represents the fear of rejection by both these worlds. The mandibular right third molar is a barometer of our physical energy.

If one looks at the characteristics of all third molars, one will discover the typical adolescent problems a young person faces at the time of eruption of these teeth. For example, I repeatedly see complicated eruptions of mandibular third molars in students during the examination period, when they are weaker both mentally and physically. I adopt a very conservative approach towards radical and preventive extractions of the third molars because I consider them to play an important part in the energy balance of the whole organism.

In order to learn much more about this topic, I recommend that you read a book by French dentist Dr. Michèle Caffin, *Quand les dents se mettent à parler* (When the teeth talk). I wish you many interesting discoveries in observing the manifestations of the professional and emotional lives of your patients in their teeth.

**Editorial note:** This is the second of a two-part article which first appeared in Cosmetic Dentistry 2/15. A complete list of references is available from the publisher.

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**Fig. 13**

**Fig. 14:** Czech edition of a book by Dr. Michèle Caffin, *Quand les dents se mettent à parler* (When the teeth talk).

**contact**

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During this journey towards business growth and educational development with this new series on tips for success in your dental clinic, I am going to explore various factors of our success and professional development as dental practitioners. I will share with you the knowledge I have gained within the past 24 years of managing and evolving my clinic, so you can be one step ahead and avoid the mistakes I made, starting with the first tip: know yourself, which entails acknowledging your mistakes. It is an extremely useful and sometimes painful process.

How can we really learn the areas in which we need to improve ourselves (clinics) and in which we are advanced? The answer is through the use of an essential tool we ought to use every six to 12 months, SWOT analysis. With this tool, we will be able to discover and recognise our strengths and weaknesses as both dentists and individuals, as well as identify opportunities for and threats to our clinics. Let us analyse this a little bit further.

**Strengths**
- What do you consider as strengths, as your competitive advantages in your dental clinic?
- Do you offer a large variety of services that fulfil your patients’ needs?
- Can your patients find you and book an appointment easily with your clinic?
· Is your clinic characterised by high-technology and do your patients appreciate this?
· Is your dental clinic in a convenient location, allowing your patients to find you and reach you with ease?

Weaknesses

· What are the areas that need improvement at your dental clinic?
· Are your payment options inflexible?
· Do patients have to wait for more than 5 minutes for their appointment in the waiting area? Is the clinic decoration old and out of fashion? Should you change it?

Opportunities

What are current social, financial or other trends that you could benefit from? For example, the demand for invisible braces for adults could be useful for an orthodontist to explore. The general dentist could consider including an aesthetic treatment based on the latest trends, such as whitening or restoration with white aesthetic material.

Threats

Is there anything happening in your environment that could be detrimental to your clinic? For example, a larger and newer clinic is to be opened in the neighbourhood or an existing competitor clinic is installing better technological equipment than that in your clinic. Other threats include political and environmental ones, such as an unstable political situation.

As a conclusion, it is evident that performing a SWOT analysis for your dental clinic will allow you to be proactive in your marketing strategies, since you will have the information necessary to develop effective strategies for the promotion of your clinic.

The second tip of this article is realising the importance of having patients who are not just satisfied but loyal. In order to understand the significance of this, let us explore the major difference between these two categories.

Satisfied patient

A satisfied patient is one who comes to the clinic for treatment and is not unhappy with the treatment or the service provided, but when a friend, a relative or a colleague proposes that he or she visit another dentist would do so. Such a patient too would not refer the clinic to others or tell others about your good treatment.

Loyal patient

A loyal patient, however, is one who will spread through word of mouth what a wonderful dentist you are, and what a brilliant scientist, advising others to visit your clinic and promoting your well-being. This is a patient who comes to your clinic regularly, is appreciative of your treatment and demonstrates this.

It is important to understand that we do not deliver a service in isolation, but as part of a culture, the culture of our clinics through the experience that our patients receive. They do not expect us to be the best just in our health care industry. We have to be the best, period. Our patients will not compare us only with
other dentists but with all the services they receive and have experienced, such as in a hotel or a restaurant. Our competitors are anyone with whom our patients can compare us. People have expectations regarding how they should and want to be treated and these become the standard by which they judge their experiences.

When nothing in particular about an experience stands out, this indicates that one was merely satisfied. It takes something memorable to turn an ordinary experience into something special. Dissatisfaction comes from something bad that one experienced and remembers; loyalty is created through memorable things that happened that one did not expect. If our treatment is not memorable, why would patients continue coming to us?

Another essential question is how do we establish the areas in which we are lacking and in which we should improve our clinics to increase the group of loyal patients? The answer of course is nothing but obvious: by asking. We can obtain patients’ opinions through satisfaction surveys.

Several studies have highlighted the growing impact of patient satisfaction on the business success of dental clinics. In a more recent study, those patients surveyed cited being unhappy with their dentist as being their main reason for changing dentists.

Our goal is to discover what the most important factors for patients are in order to foster their loyalty, as well as determine the areas in which we are underperforming in order to improve ourselves and the treatment we offer our patients.

The two tips provided in this article are a good start for all dentists in order to begin the improvement and evolution of our clinics, as well as ourselves. In the next part, I will offer two new tips that will reveal opportunities and potential of your dental clinic. Until then, remember that you are not only the dentist in your clinic, but also the manager and the leader.

Editorial note: This article is the first one from the two parts series. Part II will appear in Cosmetic Dentistry 2/2016.

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international markets

SHOFU: “We see the fastest growth coming from China”

SHOFU Dental Asia-Pacific attended the UAE International Dental Conference and Arab Dental Exhibition (AEEDC) in Dubai this year to introduce its new abrasive and restorative materials to professionals in the Middle East. The global dental materials and equipment manufacturer has been eyeing the region for a long time, but ongoing market restrictions remain a challenge. However, SHOFU is also targeting countries in Asia Pacific that promise stronger growth.

While trade show attendees from the Middle East expressed great interest in SHOFU’s materials and digital dental cameras, the company feels that the market conditions do not facilitate foreign investment. “Our meetings were good—although the fair could have been stronger. We met dentists and dental students from the UAE, Kuwait, Iran and Iraq. This is a big market, especially for Asian companies, but the market needs to open more to ease import and export,” stated Patrick Loke, Managing Director of SHOFU Dental Asia-Pacific during AEEDC. Given the company’s history, SHOFU is continuing its careful assessment of business opportunities before possibly opening a production facility or sales office in the Middle East.

In 1985, SHOFU began operating in China with the establishment of a worldwide sales network and opened a production facility and sales office 20 years later. Back then, the country had only 50,000 dentists and fewer than 200 dental clinics to serve its 1.3 billion people—about 440,000 dental professionals would have been needed to provide adequate oral health care according to Western standards.

In the last decade, the Chinese government has invested substantially in dental training facilities and schools. The result was an increase in dental clinics that led to double-digit growth in relatively new market segments, such as dental implants.

Shofu will start operating in India soon. There is growing awareness regarding dental health there.”

orthodontics

Invisible braces market to grow rapidly over next five years

According to a recently published report, the global invisible braces market is expected to grow at a 12.16 per cent compound annual growth rate from 2016 to 2021. The report analyses the development of the ceramic, lingual and clear aligners segment in ten major countries and further shows that the process will be mainly driven by technological innovations and increasing demand for invisible braces among the adult population with aesthetic concerns about fixed orthodontic appliances.

Over the past decade, improved technological advancements, particularly digital technologies, and increasing awareness of aesthetic alternatives to conventional braces have led to growing demand for orthodontic treatment with aligners.

In addition, rising disposable income has resulted in increasing per capita health care expenditure, which has further led to a growing focus on health care, thereby increasing the demand for invisible braces specifically among the adult population.

While the market has witnessed a strong foothold in North America and Europe, rapid growth in the demand for invisible braces is expected to be fueled by the emerging markets in Asia Pacific and Latin America through India and Brazil, whereas rising dental tourism in Mexico and Thailand will continue to contribute towards the invisible braces market.

Among the leading companies operating in the market are Align Technology, Ormco, DENTSPLY International, 3M and ClearCorrect.

The 152-page report titled *Global invisible braces market: Trends, opportunities and forecasts (2016–2021)* was published on 1 February. It can be purchased at www.rnrmarketresearch.com.
cosmetic procedures

AADC survey indicates digital push in cosmetic dentistry

The field of cosmetic dentistry is showing persistent growth potential, a survey conducted by the American Academy of Cosmetic Dentistry (AADC) has found. The majority of respondents believed that cosmetic procedures will generate the same amount of revenue or more in the coming year, with the greatest expectation being that dental implants will continue to see the most positive growth.

"Some of the most notable findings from the survey are those that relate to larger trends in the dental industry," remarked AADC President Dr Joyce Bassett. This particularly applies to the ongoing trend towards digitalization in dentistry. Bassett said, "The digital push is definitely something being felt in the area of cosmetics – more than 50 per cent of respondents said they either currently use chairside CAD/CAM or are considering purchasing a chairside CAD/CAM system."

Concerning the most frequently performed cosmetic procedures, crowns and bridgework, bonding, veneers, and whitening made up the bulk of interventions. At 32 per cent, the most popular treatment in practices was tooth whitening.

In the survey, 93 per cent of dental professionals believed that the continued demand for cosmetic dentistry is primarily driven by referrals from friends and family who have had a positive experience. Other factors included increasing information about cosmetic dentistry online (75 per cent), better marketing of dental practices (63 per cent), and media coverage of cosmetic dentistry (56 per cent).

According to the practitioners surveyed, patients requested cosmetic treatment mainly to improve physical attractiveness and self-esteem (86 per cent); to fix a previously failed cosmetic treatment (51 per cent); for upcoming events, such as a wedding (48 per cent); for restorative or health reasons, such as an accident or injury (46 per cent); and to look and feel younger (45 per cent).

The survey was conducted between September and November 2015. It included 360 dental professionals, of whom 89 per cent described themselves as either general dentists (60 per cent) or cosmetic dentists (29 per cent). Among the respondents, 74 per cent were AADC members.


colour assessment

Study evaluates accuracy of digital v. conventional shade measurement

Matching the shade of the natural dentition is of great importance for achieving a good aesthetic result in prosthetic reconstructions, especially in the anterior region. Although various computer-based shade determination systems have been developed in recent years, the use of this new technology has not been widely evaluated in clinical settings. A study has now compared the reliability of two digital shade measurement solutions with the conventional method for colour assessment, the human eye.

In the study, researchers from the University of Copenhagen in Denmark and the Saints Cyril and Methodius University in Skopje compared 3Shape’s TRIOS shade measurement tool, MHT’s SpectroShade spectrophotometric computer-based system and VITA Zahnfabrik’s VITA Toothguide 3D-MASTER, a conventional colour tab system.

According to the researchers, reliable visual shade selection by the human eye can be inconsistent owing to the complexity of tooth colour and external factors, such as room lighting, patient clothing and even make-up. In order to compensate for these variables, the shade determination was performed in natural daylight, but away from windows and with no direct light. Lipstick or other factors that may affect colour assessment were removed, and patients with brightly coloured clothing were covered with a neutral cloth.

Shade determination was tested on 87 teeth in 29 patients between the ages of 22 and 62. In order to validate the various methods, two dentists selected the colour tab they considered to be the best match for each tooth and with each method. The colour tabs chosen were then evaluated pairwise.

The study found that the reliability of the computer-based systems was higher than that of the conventional visual system. The TRIOS measurement system achieved the greatest agreement for colour chroma and hue, whereas SpectroShade demonstrated the highest agreement for colour value. However, no significant differences were found between the TRIOS tool and the colour tab system and between SpectroShade and the colour tab system.

According to the researchers, the results support the use of computer-based scanning and shade measurement systems for dentistry. They concluded that further development of such systems for clinical use could be valuable for material selection and restoration design, particularly in aesthetic and restorative dentistry.

The study titled Effectiveness of shade measurements using a scanning and computer software system: A pilot study was published on 25 April 2015 in the International Journal of Oral and Dental Health.
Enlighten: “The most important feature of a whitening system is predictability”

Enlighten is widely acknowledged as the most effective teeth whitening system in the world. With over 200,000 VITA shade B1 Guaranteed procedures, Enlighten has a 98 percent success rate, irrespective of starting shade. Enlighten is a combination of home whitening followed by in office. There are no lights or lasers, the system comes with impression materials, bleaching labwork, desensitizers and toothpastes.

“Our users understand that the most important feature of a whitening system is predictability and wow results”, said Dr Payman Langroudi, Clinical Director “There is nothing worse or more damaging to a practice than underwhelming whitening results, we really think we have a breakthrough” continued Langroudi “We are looking for the top 5 to 10 per cent of dentists in each country, to become Enlighten Centres of Excellence.”

Enlighten partners with dentists and provides both clinical and marketing training to all the team. Enlighten trained dentists do four times as much whitening as a result. There is no need to change diet or habits like smoking, and results last indefinitely with very simple maintenance. “When a patient asks how white their teeth will go, the dentist can confidently predict a minimum B1 shade. When they ask how long it will last, the dentist can confidently say forever”, says Langroudi.

The company is pursuing an aggressive international expansion from its London base with a combination of joint venture and distributor partnership models.

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VOCO to give its headquarters in Cuxhaven a boost

More room for further growth: Given its ever-growing market presence and the resulting order situation, VOCO has long needed to expand its production capacity. And this process has been initiated: With the cutting of the first sod, the management of the family company marked the start of construction work on the 5th building phase.

With this expansion VOCO is not just reacting to the need for more space. The project is also a clear statement of the company’s commitment to strengthening the headquarters in Cuxhaven. A step which ‘in the medium term will, of course, result in the creation of more jobs in the region’, explained Manfred Thomas Plaumann, Ines Plaumann-Sauerbier and Olaf Sauerbier (VOCO management). The central company site is home to all areas of the company, from R&D, administration and sales to production.

The central company site is home to all areas of the company, from R&D, administration and sales to production.

Left: With the cutting of the first sod, Manfred Thomas Plaumann, Ines Plaumann-Sauerbier and Olaf Sauerbier (VOCO management, from left) marked the start of the construction project to expand production at the dental company based in Cuxhaven (Photo © www.voco.com).

Plans to expand production have been in discussion for around a year with the Bremerhaven planning company Müller und Peters. The Cuxhaven company Lüdke Hoch- und Tiefbau in conjunction with Schröder from Bremervörde have been commissioned to perform this work. The investment volume is in excess of 10 million euros.

Creation of long-term capacities

This project is the fifth construction phase. In 1997 and 2005 the production hall area, which was developed back in 1992, was almost doubled both times. Construction of the striking main building together with the laboratory building was completed in 2013. The current complex is to be expanded to include a two-storey new building boasting an effective floor area in excess of 9,000 m². The total effective floor area, including the administration and research areas, will amount to around 39,000 m² upon completion of this stage. And, of course, we have already taken future growth into account:

‘We deliberately opted for a two-storey design for this extension project in order to make optimal use of the company site’, explained the VOCO management.

Global family company

Today this family company is one of the leading brands in the dental industry and operates around the world with great success. Some 340 people work at the headquarters in Cuxhaven and, in addition, there are more than 50 dental consultants in Germany as well as 370 country-specific sales representatives around the world.

Following the inauguration of the impressive new main building with its exclusive training centre and the state-of-the-art research and development building in autumn 2013, the expansion of our production facilities is the next step to paving the way for further growth. Completion of the new production area is planned for spring 2017.

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This year’s ROOTS SUMMIT, which has drawn dental professionals to various locations all over the world in the past decade, will take place from Nov. 30 to Dec. 3 at the Crowne Plaza Dubai hotel in the United Arab Emirates. Aimed at updating participants about the latest in endodontic treatment, an unparalleled series of lectures and workshops will be held by global opinion leaders in the field.

Although the meeting will focus exclusively on the latest techniques and technologies in endodontics, the organisers have strongly encouraged not only dentists specialising in the field to attend but all who have an interest in endodontics, including general dentists and manufacturers and suppliers of endodontic products. Overall, about 700 attendees are expected.

Over the past 15 years, the ROOTS SUMMIT has grown significantly. The community originally started as a mailing list of a large group of endodontic enthusiasts in the 1990s. After the establishment of a dedicated Facebook group three years ago, membership increased from 1,000 to more than 20,000. Today, the group is composed of members from over 100 countries.

Previous ROOTS SUMMITS have been held in Canada, the US, Mexico, Spain, the Netherlands, Brazil and last year in India. These meetings have been known for the strength of their scientific programs and their relevancy to clinical practice. The lectures, workshops and hands-on courses scheduled for this year’s meeting will be no exception. More than 15 distinguished experts are presenting during the conference.

For the summit in Dubai, the organisers have partnered with Dental Tribune International (DTI) and the Dubai-based Centre for Advanced Professional Practices (CAPP) for the first time. With its international network, composed of the leading publishers in dentistry, DTI reaches more than 650,000 dental professionals in 90 countries through its print, online and educational channels, as well as a number of special events.

Over the past decade, CAPP has been able to establish first-class standards for continuing dental education programs not only in the UAE but also across the Middle East. Since 2012, CAPP has been affiliated with DTI as a strong local partner in the Middle East.

Based on the successes of previous ROOTS SUMMITS, the organisers anticipate a large turnout for this year’s meeting. Various sponsorship opportunities are available, including booth space, as well as sponsorships of workshops, hands-on courses, meeting bags and social events.

Online registration for the ROOTS SUMMIT is now open at www.roots-summit.com. Dental professionals are also invited to join the ROOTS Facebook group and like the ROOTS SUMMIT 2016 Facebook page.
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World-class speakers, hands-on instruction, master classes, forums and social networking opportunities, all in the heart of one of the greatest cities in the world. Between June 23 and 26 this year, the fabled Waldorf Astoria in Manhattan will be hosting the Nobel Biocare Global Symposium under the banner "Where innovation comes to life."

Four days of learning

The symposium’s four-day program will be based on three main themes: refining and enhancing treatment, digital dentistry and achieving clinical excellence in challenging situations. Each theme has a complete schedule of its own, including lectures, master classes and practical sessions. Should attendees choose to follow only one theme, the symposium schedule allows them to be a part of every related session.

If, on the other hand, delegates would like to pick and choose between the different themes and attend individual sessions of special interest in several (or all) of the themes, Nobel Biocare gives them the opportunity to design their own learning program.

In addition to a theme-related agenda intertwined with independent study opportunities, the company is arranging a compelling array of forums, including an innovation assembly and a full-day compromised patient forum. Other forums will cover the company’s Partnering for Life program, through which Nobel Biocare helps dental professionals achieve their goals, the All-on-4 treatment concept and the dental laboratory workflow. A new generation of dental professionals will also have their own platform at the event’s NEXT GEN forum.

Getting to know each other

After a busy first day of lectures, master classes and hands-on sessions, a welcome cocktail on June 23 will provide the perfect opportunity to unwind and network with colleagues from around the world. Attendees will be able to raise a glass, enjoy some food and see a display of innovative Nobel Biocare products in the beautiful, historical setting of the Waldorf Astoria.

On the evening of June 24, Nobel Biocare will be hosting the symposium’s reception off-site at an exciting venue, yet to be revealed. It is set to be an evening to remember with an inspiring blend of diversion and education.

By popular demand

The Scientific Chairmen for the Nobel Biocare Global Symposium are Drs Peter Wöhrle (USA) and Bertil Friberg (Sweden). They recently announced that—for the first time at a Nobel Biocare dental event—registered attendees will be able to have a direct impact on the program by voting for various topics and speakers on the event’s website. The results will be revealed a few weeks before the symposium.

With world-class lecturers and thousands of dental professionals from around the world exploring the future of dental implants together, the 2016 Nobel Biocare Global Symposium promises to be an incomparable experience for everyone involved.

Registration for the symposium is open at: www.nobelbiocare.com/global-symposium-2016_

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www.mis-implants.com

EAED 30th Annual Meeting
2–4 June 2016
Copenhagen, Denmark
www.eaed.org

Nobel Biocare Global Symposium
23–26 June 2016
New York, USA

AAED 41st Annual Meeting
3–5 August 2016
Dana Point, California, USA
www.estheticacademy.org

FDI Annual World Dental Congress
7–10 September 2016
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www.fdi2016poznan.org

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submission guidelines:

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

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

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

Text length

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

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

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.

Text formatting

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

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

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

Any formatting contrary to stated above will require us to remove such formatting before layout, which is very time-consuming. Please consider this when formatting your document.

Image requirements

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

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

In addition, please note:

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

Larger image files are always better, and those approximately the size of 1 MB are best. Thus, do not size large image files down to meet our requirements but send us the largest files available. (The larger the starting image is in terms of bytes, the more leeway the designer has for resizing the image in order to fill up more space should there be room available.)

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

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

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

Abstracts

An abstract of your article is not required.

Author or contact information

The author’s contact information and a head shot of the author are included at the end of every article. Please note the exact information you would like to appear in this section and format it according to the requirements stated above. A short biographical sketch may precede the contact information if you provide us with the necessary information (60 words or less).

Questions?

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