Learning and applying the Natural Layering Concept

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Composite resins nowadays occupy a paramount position among restorative materials because they offer excellent aesthetic potential and acceptable longevity, with a much lower cost than equivalent ceramic restorations for the treatment of both anterior and posterior teeth. In addition, composite restorations allow for minimally invasive preparations or no preparation at all when replacing decayed or missing tissues. This approach is part of a new concept termed bio-aesthetics that gives priority to non-restorative or additive procedures, such as bleaching, micro-abrasion, enamel re-contouring, direct composite resins, bonded bridges, and implants, in the case of missing dental units or cases that are more complex. These many procedures definitely merit further attention because they offer tremendous improvements in practicability, efficiency and predictability. All together, bio-aesthetics undoubtedly moves aesthetic and restorative dentistry to a new level; one that can be described as comprehensive and conservative smile design.

For quite some time, the creation of perfect direct restorations has been an elusive goal because of the imperfect optical properties of composite resins and perfectible clinical procedures. The attempt to mimic the shades and layering techniques developed for ceramic restorations led to complicated application methods, controllable only by highly skilled practitioners. For years, this has limited the number of patients who could benefit from the tremendous advantage of free-hand bonding. The use of the natural tooth as a model and the identification of respective dentine and enamel optical characteristics (tristimulus L*a*b* colour measurements and contrast ratio) have been essential in developing better direct tooth-coloured materials.
The Natural Layering Concept (NLC) is a simple and effective approach to the creation of highly aesthetic direct restorations. The concept is increasingly referred to in the field of composite restorations; thus, the aim of this article is to familiarise the practitioner with the features and clinical aspects of this new technique.

**A new array of indications for free-hand bonding**

Besides classical indications, such as the filling of Class III, IV and V cavities, many other aesthetic or functional problems can be addressed by simple direct composite restorations. The indications are as follows:

1) **Congenital aesthetic deficiencies**
   Owing to the early preoccupation of patients with these aesthetic anomalies, a conservative aesthetic correction of these conditions is increasingly mandated (Figs. 1a–f):
   - displasia/discolorations;
   - hypoplasia;
   - unusual tooth forms or dimensions; and
   - diastemas.

2) **Post-orthodontic conditions**
   Lateral incisor aplasia or incorrigible canine impactions are frequent findings, approached often with an orthodontic solution. Unfortunately, different anatomical, functional and aesthetic anomalies may result from such an orthodontic approach. Patients’ increasing concern for aesthetics obliges the dental team to correct these deficiencies (Figs. 2a–h):
   - unusual crown dimensions (larger or smaller);
   - unusual root diameter (larger or smaller);
   - unusual shape of the crown;
   - difference in colour (mainly for cusps); and
   - difference in gingival contour or level.

3) **Acquired and other aesthetic deficiencies**
   Many other aesthetic deficiencies in fairly intact dentitions also require conservative correction (Figs. 3a–e):

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Fig. 1a  Pre-op view of a 50-year-old patient with natural arrangement of teeth following bilateral incisor aplasia.

Figs. 1b & c  Lateral views demonstrate the numerous aesthetic deficiencies, such as incorrect space distribution, tooth form proportions, axis and abrasion.

Figs. 1d & e  Post-op view of reconstructed smile following bleaching and the use of additive procedures.

Fig. 1f  The 4.5 years post-op view shows the good behaviour of these restorations and illustrates the potential of conservative adhesive dentistry to resolve relatively complex aesthetic cases.
Fig. 2a–c. Smile of a 30-year-old patient showing aged and unaesthetic composite reconstructions of canines, following lateral incisor aplasia.

Fig. 2d. A rubber dam is in place from premolar to premolar to allow for a full smile view and comprehensive correction of the six front teeth.

Figs. 2e–h. The post-op views show the final conservative smile rehabilitation, using direct bonding to re-establish better tooth proportions and forms (enlargement of central incisors, reshaping of lateral incisors and premolars).

Discolourations (i.e. traumatised non-vital tooth); diastemas; abrasion, abfraction and erosion lesions; tooth fractures; caries; and functional deficiencies.

All aforementioned conditions are potential indications for conservative additive treatments, according to pre-existing tissue loss and functional status.

A new shading concept

The use of the natural tooth as a model was a logical development of direct restorative materials that led to the simplified shading and layering concept, the NLC. It is based on the identification of true dentine and enamel optical characteristics using tristimulus L*a*b* colour and contrast ratio measurements.1,3,4

Dentine replacement

The aforementioned measurements led to the following recommendations regarding the optical characteristics of an ideal material aimed at replacing dentine:

- single hue;
- single opacity; and
- large chroma scale (beyond the four chroma levels of the VITA system)
Actually, variations in a* and b* dentine values between 'A' and 'B' VITA shades seemed not to justify the use of distinct dentine colours, at least for a direct composite restorative system. Likewise, the variations of the contrast ratio (opacity–translucency) within a single shade group did not support the use of different dentine opacities (i.e. translucent, regular or opaque dentine). However, the concept of a large chroma scale covering all variations of natural dentitions plus some specific conditions like sclerotic dentine (as found underneath decays, fillings or cervical lesions) proved justified.

**Enamel replacement**

Concerning enamel, differences in tissue lightness and translucency proved generally to vary with tooth age. This confirmed the clinical concept of three specific enamel types:16

- **Young enamel:** White tint, high opalescence, lower translucency;  
- **Adult enamel:** Neutral tint, lower opalescence, intermediate translucency; and  
- **Old enamel:** Yellow tint, higher translucency.

These findings have logically fashioned the concept of an optimal restorative material. Dentine shades should be available in one single hue (VITA ‘A’ or Universal dentine shade) with a sufficient range of chroma (covering at least the existing VITA shade range) and presenting opacity similar to that of natural dentine. Enamel shades should present

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**Fig. 3a** Young adult presenting hypoplasia of numerous front teeth. Some lesions were previously restored with an incorrect direct composite technique.  
**Figs. 3b & c** Teeth were bleached before initiation of a new restorative phase. The previous composite material was first removed to expose underlying sound tissue.  
**Figs. 3d & e** Better tooth shape and colour integration could be achieved through a simplified and improved direct restorative technique (NLC) and Miris 2.

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**Fig. 3a**

**Fig. 3b**

**Fig. 3c**

**Fig. 3d**

**Fig. 3e**
Figs. 4a-c. The centrifugal technique: Post-preparation (a). The first layer is the dentine increment, placed in the depth of the preparation (b). The second layer is the enamel increment, creating the restoration surface (c).

**Fig. 4d-g.** The bucco-lingual technique: for optimal 3-D control of complex build-ups. Post-preparation (d). The first layer is an enamel increment, placed into the silicone index (e). The second increment is the dentine, placed buccally onto the previous enamel layer (f). The third layer is composed of additional enamel increments, creating the restoration surface (g).

**Figs. 5a-c.** The maturation of tissues influences incisal edge anatomy. Young tooth configuration: The dentine core that has a low chroma is fully covered with a white, opalescent enamel (a). Adult tooth configuration: The dentine core with medium chroma is usually covered with a more neutral, opalescent enamel. Dentine extends close to, or is even exposed at, the incisal edge (b). Old tooth configuration: The dentine core with higher chroma is covered with a thinner, more yellow and translucent opalescent enamel. Dentine extends to the incisal edge (c).

Clinical application of the Natural Layering Concept

Composites can be applied by following different incremental techniques for aesthetic or practical reasons and better management of polymerisation stresses. The classical approach is the centrifugal technique, indicated for Class III, small Class IV, and limited form corrections (Fig. 4a). It implies the placement in depth of one or two dentine layers (in Class III cavities, 01 with oblique position), followed by the enamel, covering the entire surface.

Another commonly used incremental approach is the bucco-lingual technique (Fig. 4b). It makes use of a silicone key made from either a free-hand mock-up (simple cases) or wax-up (advanced cases). The first layer of enamel is placed directly on the silicone key, so that it provides the lingual profile, width and position of the incisal edge of the future restoration in one step. Thereafter, dentine and effect materials (when needed) can be applied in a precise 3-D configuration. This provides the conditions for an optimal aesthetic result, as well as translucency, opalescence and halo effects.

The effect of tooth ageing on dentine and enamel optical properties

Special attention has to be paid to the morphological changes that affect the incisal edge structure due to tissue ageing and functional wear. Actually, in addition to the increase in dentine chroma and enamel translucency, the progressive thinning of the enamel layer and exposure of dentine at the incisal edge necessitates an adaptation of the layering technique (Figs. 5a-c).
A new learning experience at IDEA

Prof. Didier Dietschi is sharing his invaluable knowledge and development of the Natural Layering Concept at IDEA - the Interdisciplinary Dental Education Academy in the San Francisco Bay Area. IDEA is the premier provider for advanced continuing dental education. It is the intense hands-on experience combined with the world renowned instructor, and small class size which makes IDEA unique.

Prof. Dietschi at IDEA strives for excellence in teaching comprehensive and conservative smile design with direct bonded restorations. His 4 day course covers all about esthetic adhesive anterior direct restorations. The course also features bleaching and microabrasion – Pros, Contras, ... and everything the aesthetic practice needs to know.

The course comprises well balanced theoretical and hands-on parts, which provide participants with first, the needed scientific evidences to support clinical decisions and procedures, and then, ample time to practice the different procedures leading to expertise in a developing field of dentistry (Fig.6). Dentists are spoilt today with a vast choice of procedures and products; it is therefore essential to confront the results of clinical studies and identify those options which guaranty long term success; therefore, translating complex and abundant in-vitro and in-vivo research data into clinical essentials is one of the major assets in the dental education programs of IDEA, next to the unsurpassed quality of intense hands-on teaching.

Another important aspect of this course is the focus on precision; the use of Global microscopes installed on each working station help participants to work with better vision and optimal precision, the keys to success in aesthetic restorations and easier application of all kinds of adhesive procedures. These tools are of great help in the context of such a course, even though it is not the opinion of the author that microscopes are mandatory for routine treatments in restorative dentistry. There is also a great emphasis placed on individualized teaching and the course at IDEA provides plenty of time to interact directly with course instructor; IDEA creates a learning environment that establishes a mentoring relationship between instructor and participant. IDEA’s unbeaten value is the small class size of 16 participants, which allows every participant to progress at their own pace.

Patients are becoming more and more demanding in minimally invasive treatment. Through easy access to information sources they become more discriminative in their choice for aesthetic treatments. We can therefore expect that patients and dentists as well, will better understand the
tremendous advantage of non-invasive techniques which can not only fulfil many of our aesthetic needs but also will also contribute to better preserve patient dental capital.

The vision at IDEA is to share the knowledge and the clinical expertise of Prof. Dietzchi with colleagues from around the world and to improve and facilitate their existing operation protocols, instrument and product selection and ultimately to help them achieving the highest level of aesthetics and precision in restorative dentistry.

Conclusion

Traditional restorative objectives have not changed over time; they were simply implemented by the aesthetic demands of an increasing number of patients. Composite resins then became the materials of choice for young patients and less privileged people, or in any case which requires a strictly conservative approach. The contemporary practitioner is ultimately challenged to replace the missing tissues or eventually modify their configuration by applying on the patient’s teeth an artificial material, which has to simulate the appearance of natural tissues.

The Natural Layering Concept has enabled this objective to be achieved in a predictable way by incorporating newly acquired knowledge about natural tissue optical properties into contemporary composite systems. This advance can be regarded as a milestone in operative dentistry as it will give direct composite application a tremendous input, helping a larger number of our patients to receive more conservative and aesthetic restorations.

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**Why Participants Recommended This Course:**

This course was absolutely phenomenal, the lecture component was outstanding substantiated by excellent research data and the lab hands-on was even more helpful. The demos under the microscope were superb. Thank you for a great course.

- Ellie S. Dany, Oakley, CA, USA

Dr. Dietzchi is truly a master in resins. I have taken many courses exclusively in resin techniques, but I had learned the most from Didier.

- Vafeesh Saharanwal, Woodbridge, On. Canada