

Free-hand bonding: the ultimate treatment modality to enhance smiles in young patients

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Abstract

Porcelain restorations remain the preferred aesthetic option for many clinicians because direct bonding techniques are still considered intricate, sensitive and, to a certain extent, unpredictable. These drawbacks can be overcome today; clinicians are witnessing a rejuvenation of composite application techniques in the context of 'bio-aesthetics'. The author presents a case which illustrates the potential of this treatment modality

Introduction

A significant proportion of dental professionals and patients still think that ceramic restorations are the main treatment option to achieve good aesthetics, function and durability. Composite resins challenge this paramount position today because they offer excellent aesthetic potential and acceptable longevity, with a much lower cost than equivalent porcelain restorations for the treatment of both anterior and posterior teeth.¹⁻³ In addition, composite restorations allow for minimally invasive preparations or no preparation at all when assuming the replacement of decayed or missing tissues. This thinking is part of a new concept called 'bio-aesthetics', giving priority to additive, minimally or micro-invasive procedures to preserve tooth biology and bio-mechanics; although logical, this treatment approach's potential still is underexploited.

Besides classical and well-accepted indications such as class III, IV & V fillings, many other aesthetic or functional problems can be corrected by simple direct composite restorations providing outstanding aesthetic and functional

results (Figures 1 and 2).^{2,3} Actually, recent developments in composite optical properties have definitely simplified application technique, positively impacting practicability, efficiency and predictability of the treatment outcome.⁴⁻⁶

The aim of this clinical article and case report is to demonstrate the potential and multiples applications of composite as a modern restorative and aesthetic material.

Composite & free-hand bonding: a new array of indications and layering concept

The main issue when it comes to restore a smile is whether we should consider a direct or indirect option; besides minor aesthetic corrections or extensive decays in non-vital teeth, a lot of cases lie within a 'grey zone' where almost all possible techniques and materials can be considered. A simple yet effective approach to this dilemma is to follow the following treatment decision process, following a comprehensive biological, functional and aesthetic diagnosis (Table 1).

Apart from classical indications such as class III, IV & V filling, many aesthetic or functional deficiencies can be corrected by simple, direct composite restorations; these indications are reviewed thereafter.

1. Post-orthodontic conditions. Lateral incisor aplasia or incorrigible canine impaction are frequent findings often approached by an orthodontic solution; however, different

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anatomical, functional and aesthetic anomalies may result from the orthodontic approach. Other orthodontic conditions (i.e. tooth size discrepancy) can also lead to the persistence of diastemas or sub-optimal tooth position, despite an appropriate treatment. The increasing concern of our patients for aesthetics obliges the dental team to correct potential deficiencies such as:

- unusual crown dimensions
- unusual root diameter
- unusual shape of the crown
- difference in colour
- difference in gingival contour or level

(Figure 2).

2. Congenital aesthetic deficiencies. Numerous congenital conditions, such as:

- displasia/discolorations
- hypoplasia
- unusual tooth forms or dimensions,

require correction at a relatively early stage and therefore mandate a conservative approach (Figure 1).

3. Acquired and other aesthetic deficiencies. Several other conditions can develop at different ages which impact smile balance and aesthetics:

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

Aforementioned conditions are also potential indications for conservative, additive procedures, according to pre-existing tissue loss and functional status.

Table 1

Parameters	Direct option	Indirect option veneer ... to... crown
Age of patient	Younger	Older
Size of the decay	Smaller	Larger
Tooth vitality	Vital	Non-vital
Tooth colour	Normal	Non-treatable* discolouration
Facial anatomy	Normal	Altered
Number of restorations	Unrelated	Unrelated

A new shading approach: the natural layering concept

The creation of perfect direct restorations has been for long an elusive goal because of the imperfect optical properties of composite resins and complicated clinical procedures, due mainly to the attempt to mimic shades and layering techniques of ceramic restorations. The use of the natural tooth as a model and the identification of respective dentine



Figure 1a and b: Preoperative views of a 16-year-old patient with front teeth hypoplasia and moderate fluorosis.



Figure 1c and d: A wax-up was made and transferred to the mouth using a direct mock-up made with self-curing resin (Protemp Garant, 3M ESPE).



Figure 1e: Shade recording made prior to rubber placement, using a special dual shade guide, combining both dentin and enamel samples (Inspiro, EdelweissDR); this step is simplified by the 'Natural Layering Concept'.



Figure 1f: Rubber dam applied from premolar to premolar to provide a full smile view, which is mandatory to allow the placement of the silicone index, as well as to visualize the full smile line during treatment.



Figure 1g: A caliper serves, along with silicone index, to monitor tooth dimensions, proportions, and symmetry.

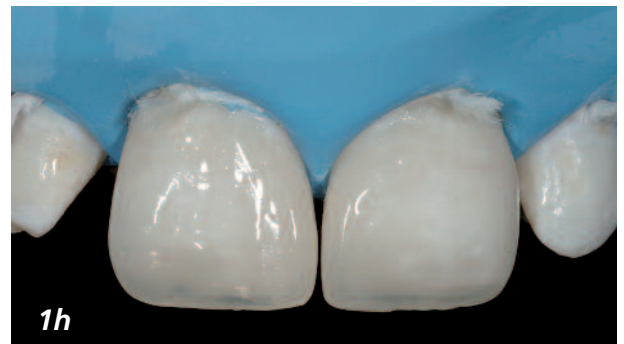


Figure 1h: Central incisors are always restored first to establish midline and tooth axis; lateral teeth can then be modified with better control of anatomy and function.

and enamel optical characteristics (tristimulus $L^*a^*b^*$ colour measurements and contrast ratio) has then been a landmark in developing better direct tooth coloured materials.⁷⁻⁹ The 'natural layering concept' is then a simple and effective approach to creating highly aesthetic direct restorations which has become a reference in the field of composite restorations.

Dentine optical features. 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.⁹ 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 dentines). However, a large chroma scale covering all variations of natural dentitions, plus some specific conditions like sclerotic dentin proved justified to meet all clinical conditions.

Therefore, the ideal material aimed to replace dentin exhibits:

- single hue
- single opacity
- large chroma scale (beyond the four chroma levels of the VITA system).

Enamel characteristics. As regard enamel, differences in tissue lightness and translucency proved generally to vary in relation with tooth age and therefore confirmed the clinical concept of these three specific enamel types:¹⁰

- Young enamel: white tint, high opalescence, less translucency
- Adult enamel: neutral tint, less opalescence and intermediary translucency
- Old enamel: yellow tint, higher translucency.

Typical brand names are Inspiro (EdelweissDR) which represents the latest development of this shading concept, as well former precursors such as Miris and Miris2 (Coltenewhaledent) or Ceram-X duo (Dentsply).



Figure 1i: The four incisors are completed; the new smile line is developing progressively. Here, both conventional bucco-lingual and centrifugal layering techniques were applied.

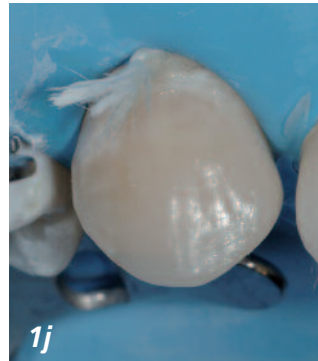


Figure 1j and k: The reconstruction of both cuspids completes the treatment; however, due to the important space excess, small diastemas remain but are invisible in a frontal view. This was considered crucial to preserve adequate proportions and dimensions.



Figure 1l: Completed smile rehabilitation using a 'no-prep' ultra-conservative approach. This treatment option has obvious advantages due to the young age of the patient but it requires a precise clinical protocol to ensure satisfactory aesthetic and functional outcomes.

Layering technique and clinical application

Composites can be applied following different incremental techniques for aesthetic or practical reasons, as well as for better management of polymerisation stresses.¹¹⁻¹³ For advanced cases, a modification of the classical centrifugal technique is needed, which is the linguo-buccal technique; It makes use of a silicone key made from either a free-hand mock-up (simple cases) or wax-up (advanced cases) (Figure 1E&F). It provides the anatomical and functional references required for an optimal aesthetic result, mimicking colour, translucency, opalescence and halo effects.

The aforementioned techniques allow a precise 3D placement of composite masses, what is considered crucial

to the final treatment outcome; last but not least, a methodical and gentle finishing and polishing technique will give the restoration its final beauty. The natural layering concept has then enabled this objective to be achieved in a much more predictable way, helping a larger number of our patients to receive conservative and highly aesthetic restorations.

Conclusion

Traditional restorative objectives have not changed over time; they were simply implemented by the aesthetic demands of an increasing number of patients as well as by new forms of pathologies. Composite techniques have benefited from



Figure 2a and b: Pre-operative view showing moderate wear, squarish forms and enamel hypocalcifications of both central and lateral incisors



Figure 2c: Rubber dam is placed; all enamel surfaces were sandblasted and etched while hypocalcifications were partially removed, leaving at least 1.25-1.5mm space for composite placement and colour correction.



Figure 2d: A first dentin layer is applied which provides chroma correction (bodyi2, Inspiro).



Figure 2e: Thereafter enamel is applied to create an appropriate translucency and value (skin white, Inspiro).



Figure 2f: Interproximal contours are improved, using only an enamel shade.

advances in their optical characteristics, such as the 'Natural Layering Concept', enabling more predictable aesthetic results to be achieved for all forms of anterior indications. Then, application techniques were refined and made possible the use of composite where we previously would only consider more invasive prosthetic solutions.

Composite techniques undoubtedly gained maturity and offer a wide range of successful applications; however, it remains our duty to select their indications with proper

judgment without exaggerating or neglecting their many advantages and qualities. And last but not least, one should never forget that dedication and meticulous handling remain the keys to success....whatever the selected technique is.

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Figure 2g: All planned corrections were now performed; note that micromorphology and surface details are not developed by hand instruments.



Figure 2h: Post finishing and polishing; we can visualise a slight but normal difference between the freshly applied composite and dehydrated dental tissues.



Figure 2i and j: Post-operative view showing significant smile enhancement through non-invasive and minimally invasive adhesive techniques.

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