

DECISIONAL FACTORS SUPPORTING THE USE OF DIRECT OR INDIRECT TECHNIQUES AND RELATED ESTHETIC BIOMATERIALS

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ABSTRACT

There are many options for restoring or improving a smile, including various tooth-colored biomaterials and clinical protocols. Some simple and limited tooth form or color corrections in young patients with healthy teeth logically call for a direct approach using composite resins, whereas more extensive smile rehabilitation in older patients with high esthetic demands should rationally be performed with ceramics. The various patient conditions that comprise these 'simple' examples, for which all practitioners may apply the same decision-making rationale, do not apply in increasingly complicated situations when more options appear feasible; this is exactly what the 'gray zone' in esthetic restorative dentistry is about. This introductory article presents and analyzes the multitude of factors to be considered in adopting a rational approach to this 'complex' situation faced daily by clinicians. The other articles in this publication develop first the arguments of the invited experts in favor of direct or indirect techniques and composite resin or ceramic materials, prior to a description of the state of the art in each treatment approach and restorative materials. This is followed by the conclusive outcome of a general discussion summarizing the recommendations of EAED's Active Members and conference moderators to select more rationally the most appropriate treatment modalities and biomaterials for excellence in esthetic restorative dentistry.

KEYWORDS: bonded ceramic restorations; direct bonding; esthetics; minimal invasiveness; treatment planning; veneering techniques.

Introduction

The approach for selecting the best protocols and materials to restore a smile is no different from the usual decisional approach, ie, to consider all known factors that can impact the treatment outcome. Important factors that need to be considered include esthetics, tooth longevity, biology, treatment invasiveness, treatment cost, maintenance, and renewal (Figs 1 and 2). Ideally, the analysis of these and other parameters should involve sound scientific data¹ as well as the recommendations of recognized clinical experts or expert consensus, which is not clearly defined in the literature to date and what this supplement aims to achieve.¹⁻³ Importantly, convenience or commercial productivity should not preclude a proper decision-making process. Likewise, it is essential to comprehensively communicate to patients all the objective information pertinent to the proposed treatment that may impact their decision to consent. Unfortunately, these factors and considerations are often analyzed insufficiently, leading to suboptimal, simplistic, and less-conservative treatments, as are often promoted on social media.⁴⁻⁶





Fig 1a to c. This middle-aged patient wanted an esthetic improvement but had some financial limitations. The treatment objectives were achieved with bleaching, direct bonding, and direct composite veneers on the four maxillary incisors (inspiro Composite; Edelweiss, Zug, Switzerland).

The EAED has a unique position to present and clarify the indications for various esthetic protocols, providing a modern restorative rationale grounded in a balanced integration of scientific and clinical evidence. This special supplement issue aims to present the consensus guidelines of invited experts and the collective knowledge and experience of the Active Members present at the EAED meeting in Sardinia in September 2024.

Parameters pertinent to the choice of direct and indirect protocols

Exploring the gray zone in esthetic restorative dentistry involves understanding and resolving a complex equation involving many primary and secondary factors, as summarized in Table 1.

As is to be expected, the most crucial elements from the patient's perspective are the esthetic outcome and often, nowadays, treatment invasiveness. The cost of the planned rehabilitation will of course also be relevant to the patient's decision making. From the dental practitioner's perspective, considerations are manifold, embracing many other parameters that, by their very nature, lead to some complexity in making rational decisions. Undeniably, factors such as the influence of social media and commercial productivity may lead to deviations from an ethical and sound biomechanical treatment concept.





Fig 2a to c. Replacement of the existing veneers: The treatment choice was determined by the previous treatment decision, clinical conditions, and patient's desire for a very bright shade. Both cases presented in this introduction illustrate the “gray zone in restorative esthetic dentistry” and the many parameters that make selecting the appropriate treatment approach both interesting and challenging (monolithic unstained lithium disilicate ceramics; Amber Mill; HASSBIO, Gangneung, South Korea; Mr Serge Erpen, Geneva, Switzerland).

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Another central consideration is the known, published success and failure rates of the various restoration options (direct or indirect) and material choices (composite resins, hybrid ceramics, ceramics).⁷⁻⁹ This published information can help both the patient and the practitioner to anticipate the longevity of the restorations, the need for reinterventions, and the capacity of the patient to assume the related financial costs in the long term. Financial costs are understandably decisive for many young patients. It is generally accepted that ceramics provide longer clinical service, and this is why bonded porcelain restorations (BPRs) are chosen to obtain optimal esthetic results and limit surface degradation, material wear, and chipping.⁷⁻¹⁴ They therefore tend to be preferred to composite resins¹⁵ for both full-smile and large rehabilitations involving high esthetic demands. The potential of direct composite resins needs to be considered, however, as lifespan and durable esthetics can also be achieved with these materials when risk factors and oral hygiene are well controlled (Fig 3).¹⁴⁻¹⁸

Table 1. Primary and secondary factors influencing decision making in esthetic restorative treatment

Patient	Clinical	Biomaterials	Protocols	Operator	Longevity	Treatment concepts
Age, socioeconomic environment, dietary habits, general health, esthetic expectations	Overall dental health, anatomy, orthodontic status, tissue biotype, risk of decay, periodontal risk factor, wear risk factor, tissue loss and tooth biomechanics, occlusion and function, tooth color and discoloration	Resin composites, ceramics, hybrid materials, laboratory skills, sustainability	Direct or indirect, hybrid approach, ease or complexity, analog or digital, repair and renewal options, replacement	General practitioner, specialist, experience in a given treatment approach	Clinical reports, clinical studies, reviews, expert knowledge, expert consensus	No-prep, minimally invasive, classic approach, ethics

Many clinical factors of course support such choice, although the literature about the clinical success of BPRs does not unconditionally support the view of long-lasting, perfect esthetics.⁹⁻¹² In fact, there are limits to a restoration's "esthetic lifespan" due to other factors that impact the behavior of all toothcolored biomaterials (Figs 3 and 4). A first key factor relates to the patient's anatomy, and in particular their periodontal phenotype; medium and thin soft tissue phenotypes trigger more recession, leading in time to visible, often stained cervical margins (see Fig 4). Regarding orthodontics, poor patient compliance (especially following clear aligner treatment or with regard to protective nightguards for bruxers) often compromises the outcome, potentially leading to misalignment of restored teeth or mechanical damage (see Fig 4). Function and occlusion certainly play an important role in restoration longevity; indeed, parafunctions increase the rate of mechanical failure of all restorations.¹⁹⁻²⁵ Oral hygiene is a final decisive factor in the prevention of surface and interproximal staining, both of which have a detrimental impact on tissue health and the appearance of restorations (see Fig 3). It is therefore crucial to consider that many conditions can affect the lifespan and esthetics of restorations, no matter which materials or protocols are chosen. These conditions must therefore be included in the treatment planning process when selecting the protocols and materials to be used (Figs 4 and 5). Further key considerations will be developed in the following articles, and in particular the discussion section.



Fig 3a to d. The lifespan of the two main esthetic biomaterials—composite resins and ceramics—is impacted by many factors such as periodontal phenotype; function–occlusion; and the patient’s oral hygiene behavior, oral biochemical environment, and diet. Composite resins, when applied following a strict protocol and maintained properly by the patient, offer not only acceptable esthetics but also longevity, at a much lower cost than that of ceramics, and following a mostly no-prep or a truly minimally invasive approach. Here, pretreatment view showing the situation about 8 years following treatment where composite veneers had been placed with an incorrect clinical protocol and material selection (a). Intraoperative view of the direct composite resin veneers during the finishing step (b). Posttreatment status (c) and 10-year follow-up (d). The restoration underwent only one repolishing procedure over the entire observation period.

Apart from specific considerations, the treatment duration and overall pretreatment dental condition and oral environment should also be integrated into the decision-making process. For instance, when planning an esthetic treatment for a young patient with a healthy dentition (as is often the case after orthodontic treatment, with only a few remaining anatomical and esthetic defects), a thoughtful approach is required, with hard tissue conservation being a major logical consideration. In contrast, late intervention in older people with severe dental and periodontal degradation more likely supports the use of an indirect technique and ceramics. In addition, treatment decisions may be influenced by the timing of interventions (initial vs intermediate vs late) and general health conditions (Figs 5 and 6 illustrate the potential impact of these factors on the selection of materials and treatment protocols). An intact dentition in young patients is likely to favor the choice of a no-prep, direct approach, whereas interventions in older patients who show significant hard tissue loss and biomechanical tooth fragility would presumably favor the use of ceramics and indirect techniques. Then there are the options that are available in between. No-prep

ceramic restorations are worth exploring, although at present, their longevity and success rates have not been validated.^{26,27}



Fig 4a to h. In an unfavorable biomechanical environment (for example bruxism, a thin periodontal phenotype, suboptimal oral hygiene, and poor compliance with nightguard therapy), ceramic restorations may also not look their best over time. The absolute superiority of one material over another is relative, and their respective qualities should always be correctly analyzed and weighted. Here, pretreatment conditions with diastemas and moderate attrition (a to c). Ceramic veneers on the fabrication cast (felspathic porcelain; Creation Willi Geller, Meiningen, Austria; Michel Magne, Montreux, Switzerland) and post-cementation status (d to f). Situation at the 12-year (g) and 20-year (h) follow-ups: the porcelain surface shows some degradation. Over time, gingival recessions and parafunctional stresses have also affected the integrity and esthetic quality of the restorations. Note the fissure on one veneer (tooth 22).

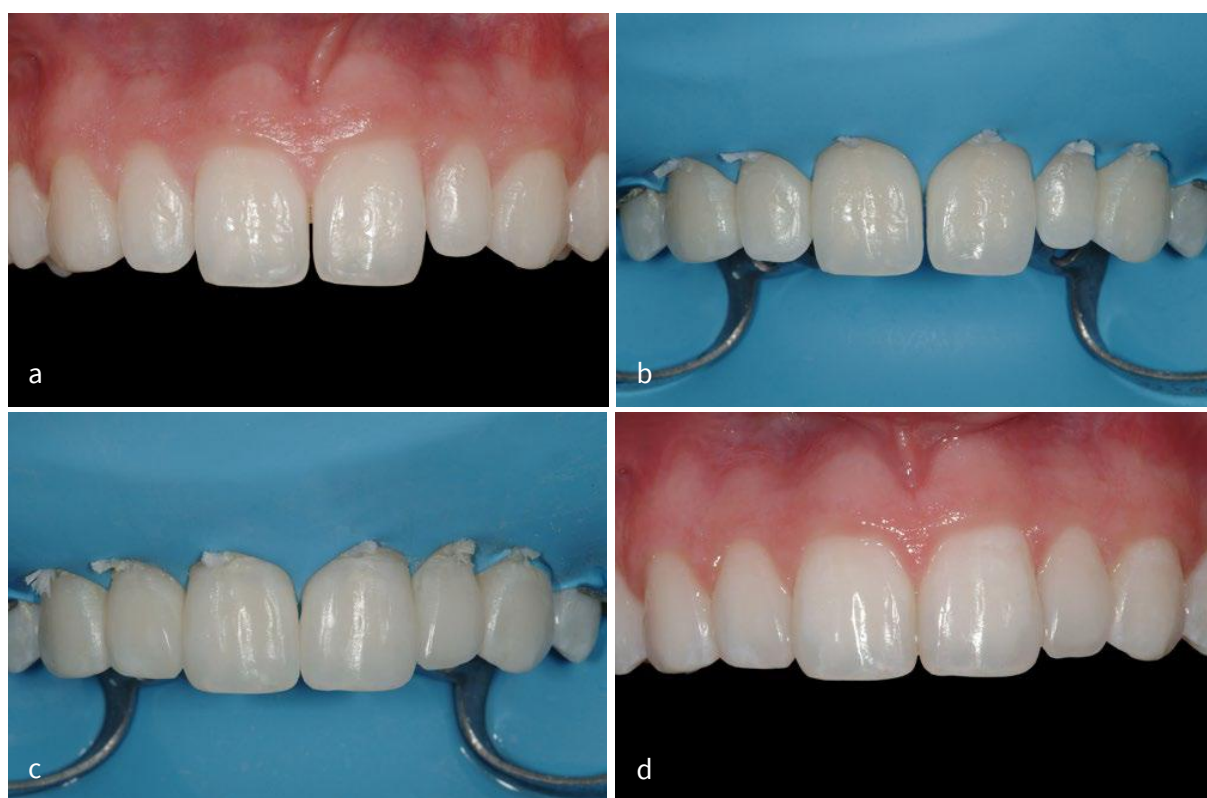


Fig 5a to d. Primary intervention with direct bonding in a 17-year-old patient with healthy dental and oral conditions. Orthodontic treatment left some minor anatomical asymmetries (Bolton discrepancy) that were corrected using no-prep direct composite restorations. The time of intervention combined with the need for only minor esthetic changes seemed to support such an approach, but discussing its pertinence in the light of medium- to long-term outcomes will be of great interest.

We therefore asked international experts to explore pertinent decisional parameters and current knowledge on esthetic biomaterials, including their advantages and disadvantages (Prof Dr Amélie Mainjot), and the best selection process and application protocols for direct composites (Dr Tony Rotondo) and BPRs (Dr Federico Ferraris). These invited contributors were also given the task of considering treatment “invasiveness,” maintenance, and longevity as key decisional factors, with the aim of promoting (within the limits of treatment prognosis and quality outcomes) minimally invasive or no-prep techniques.²⁸



Fig 6a to d. Secondary intervention with porcelain veneer replacement in a 38-year-old patient. The existing no-prep ceramic veneers show poor adaptation as well as soft tissue inflammation caused by excess composite cement, with the loss of some papillae volume. The former defective restorations were removed using Er:YAG laser, allowing the exposure of the anatomy of the preexisting natural teeth. This revealed some minor discolorations and surface defects. Following periodontal recontouring and crown lengthening of teeth 11 and 21, new veneers (microlayered lithium disilicate ceramics; Amber Mill; Mr Serge Erpen) with a minimally invasive preparation (0.2-mm cervical and proximal chamfer) were placed to balance form, facial anatomy, and overall tooth shade. The time of intervention and the replacement of the former restorations supported the use of an indirect approach.

Conclusions

The aim of this meeting (and this subsequent supplement) was to share the EAED's expertise and views on the gray zone in restorative esthetic dentistry, based on a critical appraisal of scientific and clinical evidence. It is hoped that the presented consensus will help practitioners not only to recommend the most reliable restorative treatment to their patients in terms of esthetic outcome, but also to embrace its biomechanical implications, expected lifespan, and long-term maintenance requirements. The discussion following the expert presentations intends to expand the reader's view of biomaterials and clinical protocols, including their combinations.

This supplement hopes to extol the virtues of more detailed and specific treatment concepts, challenging the stereotypical, simplified, and expeditious treatments too often seen on social media. We hope finally to present the full spectrum of options, from simple and highly conservative

(orthodontics, bleaching, direct composite restorations) to slightly more complex and potentially more invasive (veneers, crowns, implants) solutions. The discussion and conclusion sections will invite practitioners to put aside commercial and emotional aspects to determine the true “evidence-based” and ethical indications for both direct and indirect techniques, but without opposing one or the other, as both have their own legitimate field of application. The EAED is proud to be involved in redefining the way esthetic dentistry can improve our patients’ lives, smile, and self-confidence through a fully individualized and conservative treatment approach.

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