Direct Composite Veneers for Anterior Teeth: Prevention of Aesthetic Deformation

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Abstract  A system of finished Componeer composite veneers is a unique and having no analogy in the world elaboration of the Swiss company Coltene/Whaledent, an outcome of almost half a century experience of the company working in a field of composite materials. It combines the best features of direct and indirect restoration methods. The system is fulfilled of nano-composite Synergy D6 that has high mechanical strength, convenience for workable consistency, color stability and a system of halftone shades, which facilitates color matching. All this allows achieving excellent aesthetic results in minimal time. Application of an original standard scale gives possibility effectively assess optical properties of dental hard tissues and develop an implementation strategy of restoration before work started. Formation of Componeer form, polymerization and polishing at factory allow a practitioner fully utilize effect of “fluorescence” inherent to the material. All this allows us to position the Componeer system as a serious alternative to non-direct methods of restoration with the possibility of both high aesthetic and cosmetic reconstruction reliability.

Keywords Caries, Composite, Direct Restoration, Veneers, Componeer, Aesthetic Restoration

1. Introduction

The authors have repeatedly been described in previous articles some clinical capabilities of composite restoration systems manufactured by Coltene/Whaledent as the most striking example of a smooth, incremental transition from classical, accessible and understandable to most dentists Vita systems to the L*a*b* color system of evaluation of a tooth and respective restoration construction [1-3].

Currently, the company made another, without exaggeration, a revolutionary step in this direction. Subtotal of the 15-year collaboration with Dr. Mario Besek – the system of finished straight composite veneers Componeer – was presented at the International Dental Show (Köln, Germany) in 2011. The system is made of enamel Synergy D6 (white opalescence for young people and universal for adults) masses, which is very close to natural enamel anatomical thickness at different places of teeth. In addition, the Componeer laminates are subjected to a technologically complex procedure of multistage pre polymerization under pressure, whereby a polymerization shrinkage and internal stress factor are leveled and absence of “bubbles” and “pores” is provided both on surfaces and in thickness of the laminate. A perfectly smooth, mirror-symmetric for pair of teeth micro texture (e.g., 1.1-2.1, 1.2-2.2, etc.) is applied to the Componeer outer surface, and a special laser engraving (2 micron), which provides secure fixture of laminate to solid tissues of a tooth, is applied to the inner surface during manufacture [4].

Dentin in the Synergy D6 composite is a carrier of color in pure form (intensity), and enamel masses established in accordance with the properties of characterization depending upon physiological age of an enamel and designed to recreate the effects of transparency, color depth, i.e. characteristics determined by the L*a*b* system [2].

The very creation of Componeer was the natural result of solving of a number of problems that arise during conducting direct restorations. First, it is necessary to mention the fact that a practitioner who extensively communicates with colleagues around the world developed the system. If you attempt to systematize the above problems, it turned out that they are very similar to dental practices in different countries [5, 6].

An analysis showed that clinicians note the large number of problems on the final stage of restoration (an enamel layer formation, “microrelief” applying, finishing) due to occurrence of visual aberrations or more simply due to “tricks of the eyes” during extensive restorations including 4-6 teeth.

The problem of “mirroring” is the most severe problem of extensive restorations. First, they are difficulties of recreating an anatomical shape of teeth in the “mirror image” in the left and right quadrants of the restoration, although a variety of surface microstructures can be found even on intact teeth in some cases (Fig. 1). In addition, the
necessity to respect the "red aesthetics", i.e. the same gingival adaptation of restoration should be included here also. The following important problem is the necessity of mirror modeling "incisal angles". Moreover, as practice shows, the majority of dentists practice complete overlap of a tooth vestibular surface with composite in the presence of lesions on both proximal surfaces [5].

![Figure 1. Variety of surface relief on intact teeth in some patient](image)

Finally, problems of surface restoration microtexturing (creation of enamel ridges, individual drawing, and applying mamelons) arise before the doctor when problems of overlaying enamel layers of restoration have been overcome. At that, you have to perform these manipulations in a mirror image.

Given the fact that the restoration often takes up to 5-7 h of working time, it is not surprising that doctors in these conditions or delayed the finishing stages to the next visits, or aesthetics sacrificed for the sake of simplicity of work with the low cost of treatment.

2. Materials and Methods

In our opinion, the above problems are fully solved by application of the system of straight Componeer composite veneers. Like any new system, it requires the acquisition of certain skills, and the so-called “local adaptation”. The authors were trained to operate the system in the Training Center of Coltene/Whaledent Company and Clinic of Dr. Mario Besek (Zurich) and had the opportunity to ask all questions directly to its creators. Below, we would like to share experience of working with Componeer, describe the difficulties encountered and ways of their overcoming using examples of several clinical cases from our own practice.

First, in the authors’ opinion, as with any method of treatment, these challenges should be divided into two main groups: complexities involved during the treatment-planning phase, and the complexities involved directly during the restoration process.

The main difficulties in the planning stage are choice of Componeer size and color. We have already pointed out that the set of templates which size and anatomical shape closely matches laminates and thicknesses on different parts maximally repeats thickness of the corresponding tooth natural enamel is included in the starter kit to facilitate sizing Componeer. By getting experience in this matter, the authors can state that the conformity of the laminate length with the proposed tooth clinical length is a prerequisite for future aesthetic restoration. Given the fact that a crown of anterior teeth has enough individual geometric shape (square, tapered, etc.) the necessary form for the laminate can be given with a grinding disc (Fig. 2).

Regarding the choice of colors used in laminates, this question depends on the purposes pursued. If the main purpose is cosmetic, the color selection should be carried out in conjunction with the patient and according to his wishes. If aesthetic purposes are prosecuted, the color of the future restoration must comply with the surrounding teeth, and your choice depends on this. You also need to take into account “vitality” of the restored teeth and the presence of discolorations of other etiologies. Being available in the set, the color template that gives possibility to match shades of enamel and dentin has many help here. However, the practice has shown that fixation of a laminate of selected shade to an enamel mass of the same color is more reasonable.

Using a cofferdam is completely dependent on the preferences of a doctor; it does not perform here its primary function—isolation of dentogingival sulcus. The authors have an equivalent experience of performing restorations using Componeer, both with it and without it. If you are planning to use the kofferdam for the handkerchief incision according to the Mario Besek technique, then it is expedient to tuck the vestibular part of the handkerchief under a ready roll (better at full-size Parostiroil) and attach to the mucosa using a medical adhesive “Histoakryl”. The handkerchief palatal portion is glued as well, but without any roll. The area of gluing should be treated with ethanol after finishing the treatment before removing the kofferdam to avoid the oral mucosa traumatizing.

Statistical analysis was performed using a standard
package Statistica 6.1. Standard software packages before their use was verified as the calculation artificially standardized data with a known result, which allowed characterizing the work of a particular program. When comparing the qualitative characteristics apply criteria Fisher exact probability and χ² test with Yates in editing. As a method of multivariate statistics used cluster analysis by the method of K-means for determining the types of reactions used for the restoration of the composite.

3. Results

3.1. Clinical Case 1. Patient Sh., Age 29

The initial clinical situation is shown in Fig. 3. The 1.2-2.2 teeth were previously treated by over caries. Patient complaints were primarily on aesthetic character. The front surface of the teeth was overlapped with composite. Recurrent caries were not found after visual and instrumental examinations. It was decided to restore the vestibular surface of these teeth using Componeer laminates. Medium size, universal color was selected. Enamel universal (Synergy D6) was selected as a fixing composite mass.

Dissection of the 1.2-2.2 teeth and subsequent application of the Ultrapak 000 gingival retraction cord (Fig. 5) was performed by the method described above (Fig. 4) after the cofferdam application and fixation). The necessity of using filament and time to add it is determined by the attending physician based on each clinical situation. The authors use retraction cord only in cases where the marginal gingiva has signs of inflammation (small!) and/or if it was injured during machining of the teeth. Moreover, we do the cord imposition perform just before the final fitting and fixation of the laminate and not before dissection, because we believe that the preliminary retraction of gingival changes its anatomical shape and real location.

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Final fitting of laminates, preparation of the adhesive surfaces of the teeth to be restored (Fig. 6) were performed in the next stage, after which the Componeer laminates were inserted and fixed. The result of restoration after removal of the gingival retraction cord and finishing the laminates is shown in Fig. 7.

The authors would like to immediately warn colleagues who are just beginning to work with Componeer system. Quality final assessment of the performed work should be expediently carried out after a while. In this case – after 2 weeks (Fig. 8)
The authors would also like to add that the presented case is the authors’ first clinical experience with the system.

3.2. Clinical Case 2. Patient B., Age 30

The initial clinical situation is shown in Figs. 9, 10. The 1.2-2.2 teeth were previously treated by over caries. All teeth are vital, there were complaints concerning aesthetic defect of anterior maxillary teeth. The decision to perform a combined restoration – caries treatment of the 1.2-2.2 teeth by the direct method, followed by reduction of the Componeer vestibular surface was made.

A medium size of the laminate, universal color and an enamel of the same color (Synergy D6) as the fixation composite mass were selected. Dentins A2:B2, A3:D3 and A3.5:B3 (Synergy D6) were selected for the direct restoration. Direct part of the restoration (Fig. 11) was performed after dissection and following gingival retraction cord overlay, and then laminates on the 1.1 and 2.1 teeth (Fig. 12) were inserted and fixed. Further treatment had to be postponed for 1 day due to excessive time spent during the preceding part of the direct restoration.

Applying of Componeer on the 1.2 and 2.2 teeth and finishing restorations were carried out on the next visit (Fig. 13). The result of the restoration after 2 weeks is shown in Fig. 14.
3.3. Clinical Case 3. Patient F., Age 29

The initial clinical situation is shown in Fig. 15. The 1.2-2.2 teeth were previously endodontically treated for over a complicated caries. The patient’s complaints were of aesthetic character. The decision to restore the vestibular surface of these teeth using Componeer laminates with a preliminary restoration of the teeth "dentine body" was made. Dentins C2\C3, A3\D3 and A3,5\B3 (Synergy D6) were selected for the direct restoration. Selection of the size (medium), color (universal) and individual fitting of the laminates (Fig. 17) were performed after the "dentine body" recovery (Fig. 16). Dissection of the 1.2-2.2 teeth and the subsequent imposition of the gingival retraction cord Ultrapak 000 (Fig. 18) was fulfilled after applying and fixing the cofferdam. The tint of the fixing composite mass was chosen empirically (Fig. 19) and universal (Synergy D6) enamel was selected.
Preparation of the adhesive surfaces of the restored teeth was performed on the next stage, after which the Componeer laminates were inserted and fixed. Exterior restoration after removal of the gingival retraction cord is shown in Fig. 20. Insufficient depth of overlap of approximate areas in the cervical area is clearly seen in Fig. 20. This defect was corrected by the direct method of restoration after re-conditioning adhesive enamel surfaces with universal (Synergy D6, Fig. 21). Exterior restoration after 1 month is shown in Fig. 22. Exterior restoration after 2 and 4 years month is shown in Fig. 23-24.
3.4. Clinical Case 4. Patient L., Age 16

![Figure 25. Patient L., 16 years old. Initial clinical situation.](image1)

Patient L., 16 years old, complained of a disorder of aesthetics of the upper frontal teeth. Initial clinical situation is shown in Fig. 25. After a standard instrumental examination of the teeth 1.3-2.3 for the presence of caries, it was decided to conduct the combined direct composite restoration of the upper front teeth. The restoration of the teeth 1.2-2.2 was carried out with the use of the COMPONEER, medium size, color “white opalescence”, without prior preparation. Then, the build-up of “zenith” of the teeth 1.3 and 2.3 was conducted using manual modeling of enamel composite Synergy D6, the color “universal”. The result of the restoration is shown in Fig. 26. There was no need to prepare the intact teeth 1.3 and 2.3 that is why the main tactic of the restoration was the treatment with use of the COMPONEER system. High aesthetic effect and the lack of preparation of hard dental tissues in the clinical situation were the main requirements. The condition of the restoration after 1 year after treatment is shown in Fig. 27.

![Figure 27. Patient L., 16 years old. The condition of the restoration after 12 months after treatment.](image2)

Combined restoration techniques are frequently used during the dentition correction after previous orthodontic treatment (clinical case 5).

3.5. Clinical Case 5. Patient V., Age 15

**Clinical case** 2. Patient V., 15 years old. Initial clinical situation is shown in Fig. 28. A complicating factor was the trauma of the teeth 1.1-2.1. After confirming the vitality of this teeth, the restoration of the upper 1.2-2.2 teeth was carried out using the COMPONEER, medium size, color “white opalescence” (Fig. 29 a-b, view under the various lighting).

![Figure 28. Patient V., 15 years. Initial clinical situation.](image3)

![Figure 29.](image4)
b).

**Figure 29.** Patient V., 15 years. The result of the restoration of the upper teeth using the various levels of lighting.


Initial clinical situation is shown in Fig. 31. Teeth 1.1 and 2.1 were endodontically treated. 2.1 The anodized metal anchor pin was not removed from the tooth 2.1 because of the danger of the root fracture even with the help of ultrasonic. In the teeth of 1.1 and 1.2 the intracanal bleaching Opalescence (Ultradent) was carried out. Then the Synergy D6 composite conducted a restoration of the dentin. After that, the individual fit of the veneers of the teeth 1.2-2.2 was carried out. The anatomical conditions of the forthcoming restoration led to the use of size X-large, color “universal”. Original Size XL provided the possibility of partial overlap of the diastema and tremas, while the size of the removing of the cervical portion of the veneer by the height of the clinical crown of the teeth 1.2-2.2 was 2-3 mm (Fig. 32).

During the next visit it was decided to correct the lower teeth (initial clinical situation in Fig. 29 a). The teeth 3.2-4.2 were restored by the COMPONEER system, small size, color “white opalescence” without prior preparation, and the cutting edge of the teeth 3.3 and 4.3 was restored by the method of manual modeling by the composite Synergy D6, color “white bleach” dentin and enamel “white opalescence”. The result of the restoration using the different lighting levels is shown in Fig. 30 a-b.

a).

**Figure 30.** Patient V., 15 years. The result of the restoration of the lower teeth using the various levels of lighting.

b).

**Figure 31.** Patient J., 57 years old. Initial clinical situation.

**Figure 32.** Patient J., 57 years old. Individual fit of the COMPONEER

Immediate restoration result is shown in Fig. 33 (immediately after removal GingiPack) and Fig. 34 (after finishing).
During the planned control, examination after 3 weeks after treatment (Fig. 35) the final contouring and polishing of the restoration was conducted. "Zenith" of the teeth 1.3 and 2.3 was formed by the composite Synergy D6 to correct the shape of the dental arch (Fig. 36).

After 1 year, the patient had complained of change of the color of the tooth 2.1 (Fig. 37 a). The reason for this change was a metal post in tooth 2.1. However, patient refused from the prosthodontic treatment, because this defect of the restoration was invisible in the smile line (Fig. 37 b).
In addition, we have a clinical experience of successful application of the Componeer system for direct occlusion correction (Fig. 38 – the initial situation, Fig. 39 – the result of treatment). Dissection in this case was not carried out.

In some clinical situations, we restored the smile line for quite a long distance 1.5-2.5 (Fig. 40 – initial situation, Fig. 41 – view after treatment).

4. Discussion

Unfortunately, the print job is always limited in volume and has one-way directivity because of a dialogue absence. However, we anticipate some possible objections from our colleagues, particularly from dentists and orthopedists.

The authors would like to draw readers’ attention to the fact that the Componeer system according to both the developer and the manufacturer is considered as part of a direct restoration created to solve the above problems of direct restorations. Accordingly, this system, which is made of a composite material, designed primarily for restorations of “vital” teeth, although we have successfully used it for clinical situations that were more complex. Yet we believe aesthetics and/or cosmetics of dentition frontal sites, while maintaining “the vitality of teeth”, are the main aims of its use.

The authors have analyzed ergonomic and financial components of the system in the previous work. The following four main factors have particular importance for patients and doctors:

- cost of treatment (for a patient) and cost of consumables (for a doctor);
- duration of treatment (number of visits);
- compliance with the expected results obtained;
- durability of outcomes.

The finishing, mechanical restoration and adhesive protocol for the Componeer are the same as any other composites. The main difference of this technology by indirect restorations with ceramic veneers is that the veneer is made of composite, which is fixed on the same composite’s standard form. Thus, we had not any problems with marginal adapting. For each case, we made standard processing the enamel-composite by rotary instruments grain boundaries held 40 and 8 microns. Then Soft Lex (3M) system and 3-steps polishing paste produced in Russia.
Once again, we want to repeat that the Componeer technology is positioned only as the enamel layer of direct composite restorations.

Composite Synergy D6 and Componeer officially sold in the United States and in Europe and have all the necessary certificates of conformity and registration documents of the countries on the subject of toxicity, biocompatibility, and so on. The detailed information regarding technical, chemical, biological, physical characteristics of the material COMPONEER is available on the company web site: www.coltene/whaledent.com.

Composite materials are used in dentistry for over 40 years and today we have not met any studies confirming their toxic effects on the liver, kidneys or any other organs.

Componeer laminates have clear and distinct advantages over indirect techniques of restoration for at least half of the positions. However, by no means do we not claim that the system is design to replace Componeer indirect methods of restoration completely, in particular all ceramic. Just in some cases, the system is able to make a very worthy competition to ceramic veneers on all items subject to indications, and especially considering ergonomic and economic benefits for both the patient and the doctor. Hand on heart, the majority of dentists and especially dental therapists agree that such system has been long expected by not only clinical necessity, but due purely mercenary motives also:

- Firstly, the system enables physician-therapists working in different conditions (mixed reception, self-employment and some more) to perform highly aesthetic restorations and do not turn to related professionals;
- Secondly, absence of necessity to have a dental laboratory is also an important factor.

Fig. 42 shows the dynamics of changes in the clinical status of the composite restorations in the application after 12 months of treatment presented above (manual technique, group №1).

Fig. 43 shows the dynamics of changes in the clinical status of the composite restorations when applying premium-class composite is 4 times more expensive than the cost at 12 months after treatment (Componeer, group №2).
Thus, analyzing the results of research obtained in the group №1, it can be argued that the decline in the quality of the restorations carried out as a vital and non-vital teeth, occurs in the first 12 months with the index factor ANOVA 1.1 for vital teeth and 1.15 for non-vital, indicating that statistical predictors of identity of the group.

Analyzing the results obtained in the group №2, we found no statistically significant reduction in the quality of restorations made vital and non-vital teeth, and ANOVA factor is 0.9, which indicates the statistical significance of the predictor as the preliminary endodontic treatment, even when working with composite of premium-class.

Cluster analysis results are presented in Fig. 44.

In a cluster, there is a difference in the average values of the variable between the groups of patients. The average value of the variable in the group №2 markedly lower than in the group №1, and the range of variation of average values of the variable has no significant values (P ≤ 0.1) and does not affect the objectivity of the estimated parameters.

This difference between the average values of the variable can be linked to aesthetic authenticity used composite. Since immediately after the treatment in the mean values of a variable in different groups differed non-significantly, it changed, not only the average values of the variables in different groups, but also the values differ significantly in the number of variations.

The cluster analysis method defined by the combination of the most significant predictors affecting the violation of aesthetics. The most significant defined methods of forming the enamel layer (manual or Componer) are, the vitality of the tooth, the level of dental health and oral hygienic condition.

Finally, in conclusion of the work, we hope that clinical examples from his own practice we have described will help the colleagues to acquire the necessary skills and experience to work with the system and to avoid some of the difficulties and problems that are inevitable during mastering any new treatment technique.

The authors are trying to avoid laudatory words, although we believe they would be quite appropriate here, and everyone, who has ever used the given laminates in a clinic, can easily be agreed on this. Moreover, the authors believe that the Componer system will undoubtedly be evaluated appropriately and take its rightful place in an arsenal of every medical practitioner specializing in direct restorations of dental hard tissues.

REFERENCES


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