

REVIEW ARTICLE

Materials and Techniques for Veneering Anterior Teeth Using Composite Restoratives

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ABSTRACT

Teeth veneering using composite resins are a conservative approach to improve aesthetics of patient. Due to the advancements in material science and improved clinical techniques, it has been made possible to meet the aesthetic needs of the patient. Ceramic-based laminate veneers are very popular to improve the patients smile and newer materials such as zirconia are now being used to fabricate restorations to achieve desirable results. Restoring teeth using conventional techniques i.e. crowns is a very popular method however; may require elective endodontic therapy, which may result in additional loss of tooth structure and could contribute to increased clinical costs. Adhesive dentistry allows us to replicate of the originality of the teeth and preservation of almost all dental tissues. Adhesive dentistry has seen many progresses during the last decade. In the light of least-invasive dentistry, this approach for restoring teeth has allowed the clinicians to perform much more conservative cavity design preparations. The technique relies upon the effectiveness of current enamel-dentine adhesives that have undergone many advances themselves. Indirect techniques as compared to direct techniques offer several advantages and when used effectively, results in better patient satisfaction. The short descriptive review focuses on composite veneering materials, which may be used directly or indirectly, to achieve better aesthetic outcomes. The data was collected through a comprehensive search using the keywords, "Aesthetic Dentistry; Adhesive Dentistry; Composites; Veneering" from PubMed, Medline and Google Scholar, from 2000 to 2019.

Keywords: Aesthetic Dentistry; Adhesive Dentistry; Composites; Veneering.

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INTRODUCTION

With the emergence of methods in conservative dentistry and advancements in material science and engineering, newer restorative materials have been introduced and it has become possible to address patient's aesthetic concerns satisfactorily¹. Re-producing patient's lost natural dentition is one of the important topics in dentistry nowadays. Discrepancies in shape, color and size may lead to problems, which are related to aesthetics, and when it comes to aesthetic aspects, veneering of the teeth is a viable conservative approach, which can be done very effectively¹. Other predictable options available to restore lost or damaged dentition include provision of inlays, onlays, crowns and bridges.

Composite veneers are a viable option for a

patient seeking aesthetic rehabilitation specifically for his/her anterior dentition. The technique for composite placement is conservative and offers predictable results. Full veneer crowns are considered more durable however; composite placement requires minimal tooth preparation comparatively. Crowns require aggressive tooth preparation as compared to composite veneers². These can be of many types based on the type of materials and the techniques, which are used to fabricate them. Composite and porcelain veneers have become very popular recently but many dentists prefer composites to porcelain mainly because desired results can be obtained. Composites are also durable, biocompatible and require less tooth preparation³. The current descriptive review discusses the materials and techniques, which may be applied to achieve aesthetic needs of a patient.

DISCUSSION

As the esthetic aspect is becoming increasingly important for patients and efforts have been made so that physical characteristics of tooth colored, metal-free materials i.e. composites and ceramics could be improved⁴.

Composites as Restorative Dental Materials

The last decade has seen several developments and modifications in material formulations and that has significantly improved clinical performance of aesthetic materials⁵. The restorations placed over anterior and posterior teeth using composite resins accounts for more than half of all the restorations placed respectively⁶.

Dental composites are a mixture of silicate glass particles, which are present within an acrylic monomer polymerized during its application procedure. Four major components of composites are polymer matrix, inorganic filler particles, a coupling agent and the initiator-accelerator system^{7,8}. The coupling agent present within bonds the organic resin matrix to the individual filler particles. It is desired that the newly developed composites should have reduced polymerization shrinkage, good fatigue resistance, higher fracture toughness, superior compressive strength and lower co-efficient of heat conduction⁹. In addition to these, aesthetic properties such as high color stability, optimum polish-ability are also desired. If these properties are present and standards are met, the composites will offer long-term surface gloss, absence of marginal leakage or staining and thus, excellent long-term anatomical forms of the build-ups should be expected. Composites are primarily classified because of the particle size and the amount and composition of the inorganic filler as shown in Table 1⁹.

Table 1: Classification of composites according to the particle size and inorganic filler content.

Type	Filler by weight (%)	Particle size(μm)
Macrofill	70-80	10-100
Microfilled	35-60	0.01 -0.1
Nanofill	72-89	0.005 -0.01
Hybrid	75-85	0.4-1

Likewise, they may also be classified according to their handling characteristics i.e., flowable or packable. Inorganic fillers provide the re-enforcement in composites and nano-fillers have tremendously enhanced the mechanical and physical aspects of dental composite resins. Hybrid composites are formulated with mixed filler systems that contain

both micro-fine (0.001-0.1 μm) and fine (0.1-10 μm) particles which enhances the surface texture and polishability and thus, considered to be the ideal choice for incisal edge repairs, class 5 cavities and other anterior restorations. More recently, nano-hybrid composites have been produced with a particle size, which ranges from 1 to 100nm. These have reduced viscosity, finest optical properties and excellent polishability^{10,11}.

Alternative Aesthetic Restorative Materials

In order to accomplish the concept of minimal or no preparation, indirect veneering was introduced in 1980s as a conservative alternate to full veneer crowns¹². The increased demands of aesthetic rehabilitation can be fulfilled by both direct and indirect techniques however; the latter requires further patient appointments in order for the procedure to be completed. Indirect technique is proffered technique when accuracy in tooth shade and shape is required during provisional restorative phase¹³. The indirect technique allows the clinician to pre-visualize the definitive aesthetic outlook and thus, helps the patient as well as the clinician to make adjustments if desired before any indirect modifications are made to the esthetic zone^{14, 15}. With introduction of better materials and improvements in clinical techniques, it is not just about restoring and preserving the natural dentition but more importantly, the results must be esthetically pleasing (Figure 1 A, B).



A



B

Figure 1 (A and B): Pre-operative anterior and palatal views of a patient with worn dentition.

Below are post-operative clinical pictures of the same patient who's restorations were carried out with composites successfully (3M Filtek Supreme, 3M ESPE, USA) are shown in Figure 2 (A and B).



A



B

Figure 2 (A and B): Restorations carried out with composites successfully (3M Filtek Supreme, 3M ESPE, USA).

Several materials can be used to fabricate i.e. feldspathic ceramics, hybrid composites, or high-density ceramics (alumina, glass-infiltrated zirconia)¹². Zirconia is being processed using CAD/CAM nowadays and has excellent translucent properties however; further improvements in terms of translucency are required^{16,17}. Composites have undergone many improvements over the years and are widely used in anterior and posterior regions due to their bio-compatibility. These allow conserving the tooth structures as compared to the ceramics, which would require some natural tooth preparation since thickness of ceramic laminate veneers, are at least 0.5 to 0.8mm thick on the labial surface of the tooth¹⁸. Ceramics are irreversible restorations as compared to composites. Composites can be readily modified according to the patient's requirement and thus are beneficial for younger individuals as it allows them to keep their options for future restorative modifications.

While the scientific literature is more extensive for ceramic laminates, a clinical trial (with a 3-years

follow-up) has reported no significant difference in the survival rate of composite veneers (87%). However, some surface quality changes were more frequently observed for the resin materials i.e. minor voids and defects and slight staining at the margins¹⁹. Composites have proved to be cost effective, can be directly placed on a single appointment and thus, obliterate additional laboratory costs whereas ceramic veneer fabrication requires multiple laboratory steps and additional costs. It is worth mentioning that porcelain surpasses composites when it comes to appearance, as composite resin loses its perfect polished finish due to functional wear and abrasion^{20,21}.

Other materials, which have proved to be successful in different clinical situations, are zirconia ceramics, when compared to other all ceramics systems²². In vitro studies have demonstrated a flexural strength of 900–1200MPa for zirconia ceramics^{23,24}, and a fracture toughness of 9–10MP am 1/2^{25,26}. Mechanical strength of zirconia is said to be three times more than other ceramic systems and²⁷ the material is proven a versatile material based on its mechanical²⁸ esthetic²⁹ and biocompatible properties for the posterior region however; there may be some limitations for its use in anterior regions³⁰.

Treatment Modality

While selecting any type treatment modality it is crucial that the clinical behavior of the material, which is being used, is understood³¹. Whether its midline diastema, incisal fracture, minor alignment issues, teeth discoloration and enamel disorders, these conditions can be effectively treated using direct or indirect composite veneering. The evolution of newer versions of composites with hybridization of their filler content and resin particles has improved the material substantially; they have now better adequate chromatic and dimensional stability, wear resistance and stronger bonding tooth surface interface properties^{32,33}.

Direct composites may also be a suitable option but its technique sensitive and increases chair side time. Whereas indirect composite veneering requires a second or third visit but it has reduced effects of polymerization shrinkage, improves bonding strength to tooth and reduces the chances of micro leakage³⁴.



A



B

Figure 3 (A and B): Mock up wax build up on a diagnostic cast.

Indirect veneering requires a mock up wax build up [Figure 3(A and B)] on a diagnostic cast and a poly vinyl siloxane impression material is used to make a putty template [Figure 4 (A and B)] of the mockup, which is then transferred, to operators.



A



B

Figure 4 (A and B): Putty template of the mockup.

The surface is etched with 37% phosphoric acid

and washed with air water spray and bonding agent is applied to lute the composite, template is assembled and composite is deposited in a layer-by-layer fashion and light cured, this technique provides superior marginal integrity, accurate shade production and reduced polymerization shrinkage³⁵. The indirect technique of placing composites has surpassed the deficiencies of direct composites such as marginal leakage and shade inaccuracies and has shown better outcomes in terms of longevity, periodontal health and patient satisfaction but requires additional visits³⁶.

CONCLUSION

Although there is a lot of development in composite systems, literature still favors porcelain-based veneers to be, a better solution for better aesthetic out-comes. Ceramic based veneers and crowns provide better outcome in terms of longevity nevertheless are more invasive and costly. The increased practice of veneering techniques with indirect composites is due to improvement in the properties of composite materials in the last years. The decision to use type of material and technique will depend upon factors such as patient selection, availability of the suitable material and laboratory expertise and costs.

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CONFLICT OF INTEREST

There was no conflict of interest among the authors.

AUTHORS' CONTRIBUTIONS

SS and HN wrote the manuscript. SR and FF took photos and coordinated with the laboratory technicians. HR performed the treatment of the patient and reviewed the final manuscript before submission.

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