RESEARCH PAPER

Smile Design Using Microveneer – A Narrative Review

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ABSTRACT:
The expanding emphasis on minimally invasive and aesthetically oriented restorative dentistry has contributed to the increasing usage of micro-veneers. Unlike conventional veneers, micro-veneers require minimal or no tooth preparation, giving a conservative option for improving anterior dental aesthetics. The success of this treatment technique depends primarily on accurate case selection, adequate material choice, and thorough cementation procedures. This narrative review summarizes the fundamental principles, material considerations, preparation approaches, cementation protocols, clinical advantages, and limitations of micro-veneers in contemporary smile design. Micro-veneers have shown favourable clinical outcomes in the management of minor aesthetic and functional concerns, including diastemas, enamel defects, and mild discoloration. Among restorative materials, ceramics particularly lithium disilicate and feldspathic porcelain—demonstrate superior aesthetic qualities and long-term performance compared with composite resins. Advances in digital workflows, microscopic preparation techniques, and CAD/CAM technology have further improved treatment precision while preserving enamel structure. Successful bonding relies on effective enamel adhesion, appropriate surface treatment, and careful selection of resin cement and shade, all of which influence the final aesthetic outcome. When proper clinical protocols are followed, micro-veneers represent a predictable and conservative option for anterior aesthetic rehabilitation.

Keywords: Cosmetic dentistry, Conservative Treatment, Dental veneers, Resin Cement, Review
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INTRODUCTION:

The increasing demand for aesthetic dental outcomes has shifted the focus of restorative procedures toward achieving harmonious smile aesthetics. (1) Technological advancements, including the development of silicate cements, acrylic materials, and composite resins, have significantly transformed restorative dentistry. Modern procedures such as veneering, bonding, and bleaching not only restore tooth structure but also enhance smile aesthetics. A healthy and attractive smile reflects an individual's emotional expression and is largely influenced by the arrangement of teeth and surrounding soft tissues. An aesthetically pleasing smile contributes positively to self-confidence and plays an important role in social interaction and personal perception. (2)

Porcelain laminate veneers were first utilised to cure different types of tooth discolouration, but more conservative treatment approaches including whitening and enamel micro abrasion are gradually taking their place. (3) However, because new materials and processes are always being produced, this progress has not resulted in a decline in veneer signals. Because ceramic veneers preserve almost all of the enamel before they are applied, they are regarded as the best choice for a conservative aesthetic approach. (4)

Decades may pass before a dental veneer has to be updated. As a result, the minimally invasive cosmetic repair technique of micro-veneers is gaining popularity among dentists and patients for treating anterior teeth and achieving both functional and aesthetically attractive results. For instance, Peng et al. used computer-aided design and computer-aided manufacture (CAD-CAM) veneers to describe minimally invasive rehabilitation for severely deteriorated dentition. (5) Additionally, the number of instances reporting micro-veneer aesthetic restorations without or with minimally invasive preparations has increased due to the development of enamel bonding procedures. (6)

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Owing to their superior aesthetic outcomes and minimally invasive nature, micro-veneers have gained increasing attention in clinical research. The present narrative review provides an overview of micro-veneers and aims to guide clinicians in appropriate material selection for informed clinical decision-making. In addition, this review discusses the role of micro-veneers in smile design to offer a comprehensive understanding of their clinical applications.

SMILE DESIGN:

Achieving an ideal smile through digital planning requires a thorough understanding of the muscles of the smile display zone, facial dimensions, and aesthetic proportions. As every individual presents unique characteristics, smile design should be personalized, with careful evaluation of available treatment options. (9)

The proportion of the facial structures, facial symmetry, and facial profile are important aspects of the face to consider while designing an aesthetic smile makeover. The distance between two superciliary arches should match the face width (from one zygomatic prominence to the other) in order for a facial feature to be considered perfect, according to the available research. The pupillary or intercanthal lines have to be perpendicular to the horizontal occlusal plane of the Frankfurt. Taking into account the face's normal verticals, three hypothetical lines should be drawn to separate the face into three sections: the glabella to the superciliary arch, the arch to the nose tip, and the subnasal to the chin (10). Lip characteristics form an essential basis for an ideal smile. During smiling, approximately 2 mm of the maxillary incisors and interdental papilla should be visible. Reduced tooth display may flatten the upper lip philtrum and create a strained or aged appearance, whereas excessive exposure leads to gingival display, commonly described as a gummy smile. (11)

MICRO-VENEER:

Since, Simonsen first proposed minimally invasive dentistry (MID) in 1987, the number of citations for MID has risen continuously (12). MID is a dental procedure designed to minimise damage to the remaining teeth while maintaining the integrity and soundness of the teeth. current dental bonding materials and more conservative methods for healthy tooth tissue may be the primary causes of the trend, but patients and practitioners with new perspectives are also much to blame. Korkut et al. show how direct composite veneers may be used to provide a minimally invasive, long-lasting, functional, and natural-looking smile makeover in only one visit. (13)

To fix teeth with mismatched colours or modifications in form, dental veneers are thin, tooth-coloured shells composed of porcelain, ceramics, or acrylic that are put to the tooth's surface. In order to put veneers, a specific quantity of tooth tissue is removed, and the void is then filled with ceramic. Veneers nevertheless require some tooth preparation, despite being minimally invasive cosmetic restorations and requiring far less dental preparation than complete crowns. When paired with enamel bonding, ceramic veneers that range in thickness from 0.3 to 0.7 mm are regarded as dependable. More and more dentists are choosing conservative, minimally invasive techniques to repair deformed front teeth with minor abnormalities or excessive interdental space because of the advancements in enamel bonding and ceramic materials. In addition, they cause micro-veneers to emerge. (14)

CLINICAL APPLICATIONS OF MICRO-VENEER:

Patients prefer to choose minimum tooth structure removal when given the chance to choose, as long as the treatment's functional and cosmetic goals are met. The ceramic micro-veneer can preserve the enamel to the greatest extent feasible while restoring just minor morphological anomalies in the anterior teeth. For instance, Ojeda et al. described restoring a maxillary right central incisor to resemble the more damaged neighbouring teeth using partly laminated veneers (15). Though, the micro-veneer repair technique is only appropriate in certain situations. Therefore, case selection is the key to clinical practice. Clinical specifics including cautious tooth preparation, suitable ceramic materials, suitable cement, and restorative polishing should also be covered. (16,17)

Sometimes the labial surface of the abutments is not completely covered by the micro-veneers, which operate on a minimally invasive framework and don't require systematic tooth preparation. Due to case selection and material challenges, the clinical micro-veneer thickness is occasionally too thin to fully hide discolouration. Therefore, significantly discoloured abutments are not a good fit for micro-veneers. People with normal or mildly to moderately unusual tooth colours can generally get micro-veneers (18).

However, micro-veneers have limited ability to mask the colour of severely discoloured abutment teeth and mainly enhance the existing tooth shade rather than completely altering it. Due to the minimal tooth preparation involved, they are not considered the treatment of choice for patients with bruxism or excessive occlusal forces. Therefore, careful evaluation and appropriate management of the occlusal system are essential when planning micro-veneer restorations. (19,20).

TREATMENT PLAN OF MICROVENEER:

For remarkable aesthetic outcomes and long-term success, a clinical guideline-based approach to diagnosis, planning, and execution of ceramic micro-veneers is beneficial. In fact, using a photographic strategy to design each clinical case improves result prediction (21). The wax-up/model binomial is another crucial technique that guarantees the symmetry and proportion of the new smile in addition to photographs and films (22). Rocha et al. examined the sensitivity of minimally invasive ceramic restorations made by dentists with varying degrees of skill, as well as colour satisfaction, tooth shape satisfaction, marginal fit, and second caries (23).

They also provided a detailed clinical methodology for diagnosis, treatment planning, and implementation of

minimally invasive micro-veneers for particular aesthetic issues, including multiple diastemas, tooth form, and colour issues (24). (Fig 1) Micro-veneers were utilised in this instance to enhance the patient's maxillary teeth's appearance, primarily with regard to the many diastemas as well as the teeth's colour and form. All veneers remained in excellent condition and the periodontal tissue was healthy after two and a half years of follow-up monitoring.

In comparison to the traditional approach, a study indicated that a new minimally invasive methodology for occlusal veneer preparation with marginal chamfer had good fracture resistance and marginal adaption. They further stress that when producing micro-veneers using this technique, more enamel may be saved. Because the interaction between porcelain and enamel is easier to connect than the interface between porcelain and dentin, it is generally known that micro-veneers bind better when there is more enamel left on the surface. Additionally, prior research has shown that the strongest bonding and maximum shear pressures are obtained by abutments with unprepared teeth that maintain the greatest amount of enamel. (25)

These days, a growing number of clinical instances call for little to no tooth preparation in order to successfully bind, colour transition, and shape veneers. The first step mostly entails gathering patient information and creating an initial strategy. The second step is to use the knowledge to create an aesthetically pleasing design. In step three, the afflicted tooth must be prepared as needed, and the data must be gathered once more. Finishing and bonding the prosthesis are the last steps. If the patient is cooperative, communicates, and has enough time, the second and third visits can be combined. A 3-shape oral 3D scanner, an oral cavity model scanner, silicone rubber, polyether rubber, and alginate can all be used to create impression materials. (13,21,22,24,26)

I. Diagnostic Phase

1. Clinical evaluation and preoperative records
2. Digital Smile Design (DSD) analysis
3. Shade selection and impression making
4. Treatment planning and patient approval

II. Planning & Mock-up Phase

1. Diagnostic wax-up fabrication
2. Mock-up trial and aesthetic evaluation
3. Functional and phonetic assessment
4. Necessary modifications finalized

III. Tooth Preparation & Provisionalization

1. Minimally invasive tooth preparation
2. Shade verification and final impression
3. Fabrication of provisional (temporary) veneers

IV. Cementation & Finishing

1. Try-in and placement of definitive veneers
2. Adhesive luting and veneer cementation
3. Finishing, polishing and final adjustments
4. Postoperative evaluation and instructions

PREPARATION METHODS AND REPAIR SPACE FOR MICRO-VENEERS:

By decreasing adhesive strength, raising sensitivity, and resulting in microleakage, improper preparation might jeopardise the results of micro-veneers (27,28). Precision techniques are used over traditional free-hand procedures because micro-veneers require less restorative area.

Superior lighting and magnification made possible by microscopic preparation allow for controlled enamel removal with the greatest possible preservation of tooth structure (29, 30). Reproducibility and precision can be ensured by digitally guided preparation technologies (CAD/CAM and 3D-printed guides), which enable selected, minimally invasive reduction based on permissible trial restorations (31–33).

Success depends on having enough exterior repair space (34). Veneers can be fitted with little to no preparation if there is enough room, but little reduction is required to eliminate undercuts or sharp angles if there is inadequate space (35). Lithium disilicate veneers have great fatigue survival at 0.4 to 0.5 mm, while a minimum thickness of 0.3 to 0.5 mm is often needed (36,37). Clinical use is still limited, despite the fact that ultrathin veneers (as thin as 0.1 mm) have been created in vitro using sophisticated procedures (37). Typically, digital smile design, wax-ups, or mock-ups are used to subjectively evaluate the external repair space (38).

MATERIALS USED FOR MICRO-VENEER:

The two main materials used to create micro-veneers are composite resin and ceramic, each of which has unique benefits and drawbacks. Composite veneers are inexpensive, easily adjustable in shape and colour, and

may be installed in a single visit. With three-year survival rates of about 87%, they are susceptible to wear, discolouration, loss of surface lustre, and fractures. (39) On the other hand, ceramic veneers offer better long-term results in terms of mechanical strength, colour stability, and optical qualities. In the majority of clinical situations, lithium disilicate and feldspathic ceramics—especially third-generation systems like IPS Emax—are the preferred material due to their excellent survival rates, which can reach up to 98% after five years and 87% after twenty. When compared to composite resin, their higher enamel bonding, fracture resistance, and biocompatibility account for their consistent long-term performance. (40-43) (Table 1)

Table 1. Comparison table of materials used for Micro veneer

Material	Strength	Aesthetics	Longevity	Cost	Clinical-use
Lithium disilicate	+++	+++	+++	++	Ideal
Feldspathic porcelain	++	+++	++	+++	High aesthetic
Composite resin	+	++	+	+	Chairside use

Clinical and in vitro research also shows that micro-veneers outperform traditional veneers in terms of strength and lifespan, sometimes even surpassing them (43). Ceramic micro-veneers are now thought to be the most dependable restorative choice for minimally invasive anterior restorations because of their longevity, aesthetic appeal, and low biological effect.

CEMENTATION STRATEGIES FOR MICRO-VENEERS: BONDING, THICKNESS, AND COLOR CONSIDERATIONS:

The adhesive connection between enamel, resin cement, and ceramic is crucial to the long-term viability of micro-veneers. The best preparation for ceramic surfaces is hydrofluoric acid etching and salinization, and enamel is still the best bonding substrate. The etch-and-rinse method offers better marginal quality than self-etch systems (44,45). The preferred material is resin cement, and the best methods for micro-veneers are light- and dual-cure systems (46,47). Surface treatment and cement type both affect bond strength; regardless of the resin employed, micro-etching has been demonstrated to improve adhesion (48)

Another factor that affects performance is the thickness of the adhesive film. According to clinical and in vitro research, cement layers that are thinner than 0.5 mm decrease bond failure; for long-term durability, 0.1–0.2 mm is ideal (49). Uniform application is essential for dependable bonding, even if finite element calculations show that cement thickness has little impact on stress distribution (50).

The interaction of cement characteristics, veneer thickness and material, and abutment shade also affects the final colour result. The underlying substrate and cement colour can have a substantial impact on aesthetics with thinner veneers (<1 mm) (51,52). Discolouration can be made up for by colour test pastes, veneer staining, and shade-adjusted resin cements. The final shade is affected by resin cement translucency, polymerisation, and ceramic thickness, with thinner ceramics exhibiting more variability, according to optical investigations (26).

The aspects that determine colour and how well micro-veneer restorations work. The combination of the abutment, veneer, and cementing material colours influences the final restoration colour effect of porcelain veneer. Table 2 provides a summary of the factors that impact colour and the extent that micro-veneer restorations work restorations. (1) Abutment factors: discolouration location, lightness, hue, and saturation; (2) veneer factors: material type, veneer thickness, transparency, and quality of workmanship; and (3) adhesive factors: type, colour, thickness, and transparency. It demonstrates that the three influencing elements have a lot of minor points. Much care must be used throughout the procedure to ensure the colour after repair. Veneer thickness, material transparency, and abutment colour are the main determining factors. (26)

Table 2. The factors that impact colour and the extent that micro-veneer restorations work

Abutment Factors	Veneer Factors	Adhesive Factors
Location of discoloration	Type of material	Type
Lightness of discoloration	Transparency of material	Color
Hue of discoloration	Thickness of veneer	Thickness
Saturation of discoloration	Making craftsmanship	Transparency

CHALLENGES IN MICRO-VENEER APPLICATION: (33,53)

Clinical Aspect	Description
Minimally invasive nature	Micro-veneers require minimal tooth preparation but still present clinical challenges.
Operator sensitivity	The procedure demands high clinical expertise from both the clinician and dental technician.
Aesthetic planning	Careful aesthetic evaluation and treatment planning are essential for successful outcomes.
Diagnostic models and wax-up	Accurate model analysis and diagnostic wax-up fabrication are necessary for treatment predictability.
Morphology reproduction	Achieving natural tooth morphology can be difficult.
Structural durability	Micro-veneers may be prone to fracture or loss of retention.
Marginal discoloration	May occur due to improper bonding or marginal inaccuracies.
Secondary caries	Can develop if marginal adaptation or bonding is inadequate.
Gingival irritation	Often related to improper margin placement or contouring.
Debonding	Commonly associated with bonding errors or inadequate surface preparation.

Micro-veneers have limited clinical indications despite their conservative nature. Owing to their reduced material thickness and limited shade-masking ability, they are most suitable for the management of mild to moderate discolorations, diastemas, and minor enamel defects. However, their effectiveness is reduced in cases of severe discoloration. Several clinical factors must be carefully considered, including the availability of adequate restorative space, appropriate cementation protocols, material selection, margin design, and thorough occlusal evaluation. Failure to adequately address these factors may compromise periodontal health, restoration longevity, and aesthetic outcomes.
Therefore, careful case selection and adherence to a systematic and well-planned treatment approach are essential for achieving successful clinical results.

CONCLUSION:

Micro-veneers represent a recent advancement in minimally invasive dentistry, offering a conservative approach for both functional and aesthetic rehabilitation. Unlike conventional veneers, they require minimal or no tooth preparation and can often be performed without the need for anaesthesia, contributing to greater patient acceptance. Their advantages include preservation of natural tooth structure, a relatively simple and potentially reversible procedure, and the possibility of repair in selected cases. Micro-veneers are particularly effective in managing minor defects related to tooth form, colour, and function. When carefully planned and appropriately indicated, they serve as a predictable and patient-friendly option in contemporary aesthetic dentistry.
However, rigorous adherence to cementation standards, meticulous case selection, and the clinician's experience are critical to their effectiveness. To track results and handle any difficulties, follow-up is crucial. Micro-veneers are a useful treatment option in contemporary restorative dentistry because, when applied properly, they provide predictable, aesthetically pleasing, and patient-friendly results.

Ethical approval:

This research did not need any informed consent because we did library research. References and quotations were written based on the journal guideline.

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