



RESEARCH ARTICLE

DENTAL VENEERS: FROM THEORY TO PRACTICE

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ABSTRACT

The current state of our knowledge allows us today to propose minimally invasive treatments that meet the major requirements of modern dentistry, thanks to new approaches and new materials. Minimally invasive restorations, including veneers, whose indications are still poorly understood, require good control on the part of the practitioner, a difficult preparation and a rigorous bonding. The objective of this work is to identify from the scientific literature the indications and requirements necessary for the prosthetic realization of this type of mini-invasive bonded partial restoration on vital teeth.

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INTRODUCTION

The so-called "minimally invasive" bonded partial restorations now occupy an essential place in the modern therapeutic arsenal, either to overcome the limitations of direct restorations or, on the contrary, to offer the patient an alternative to coronal-peripheral restorations, which are considered to be more damaging to the dental organ. It will be a question of privileging the most conservative therapies possible while responding to an ever-increasing demand from patients and practitioners in terms of aesthetics and also in terms of durability and longevity. As a result, the understanding of the importance of tissue preservation and the improvement of biomaterials have made it possible to develop treatment options that better and better meet the biological, biomechanical and esthetic objectives of this so-called "minimalist" dentistry. Current dentistry is based on the principle of tissue conservation. For the past twenty years, patients have been looking for better and less invasive treatments. The current state of our knowledge allows us today to propose minimally invasive treatments that meet the major requirements of modern dentistry, thanks to new approaches and new materials. These minimally invasive restorations whose veneers require a good mastery on the part of the practitioner, a difficult preparation and rigorous bonding, as well as their indications remain poorly known.

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The objective of this work is to identify from the scientific literature the indications and requirements necessary for the prosthetic realization of this type of minimally invasive bonded partial restoration on vital teeth.

MATERIALS AND METHOD

Research Strategy: Two literature search strategies, electronic and manual, were employed for this literature review. The informatics search strategy relied on Boolean equations via MESH words pertaining to the topic on PubMed, SCIENCE DIRECT, and GOOGLE SCHOLAR databases.

The Boolean equations used in this work are:

- Dental inlay OR Dental onlay. (Mesh terms)
- Overlay denture AND dental esthetic. (Mesh terms)
- Dental veneer AND ceramic. (Mesh terms)
- Overlay AND dentistry AND esthetics. (Mesh terms)
- Overlay AND ceramic (All field)

The "manual" search strategy took place in the library of the Faculty of Dentistry of Casablanca (FMDC) in the books of the departments: Conjoint prosthesis and biomaterials, journals such as "The journal of prosthetic Dentistry", theses and residency memoirs.

Inclusion/exclusion criteria: We retained in this study, all articles published between 2008 and 2018, carried out on human beings and excluded those written in a language other than French and English.

Critical reading of articles and assessment of methodological quality: The reading of the scientific articles was carried out by a student in the Faculty of Dentistry of Casablanca (S.E.) and controlled by an associate professor (A.C.) in the service of joint prosthesis of the center of consultation and dental treatment of Casablanca. Two authors (S.E. and A.C.) independently evaluated the methodological quality of all included articles using the reading grid proposed by the epidemiologist Louis Rachid SALMI.

Synthesis and Analysis of literature: The article will be valid, if the author of the publication:

- Clearly describes a minimally invasive prosthetic treatment and details its protocol and clinical use,
- Develops or compares minimally invasive restorations based on clear and valid criteria such as: preparation design, fabrication material or resistance of the restoration...
- Evaluation of the type(s) of minimally invasive restorations based on approved statistical, mechanical and biological tests.

RESULTS

A veneer is a thin prosthetic artifice, bonded mainly to the enamel and intended to correct the shade, position and/or shape of a tooth. These artifices are contraindicated in cases of occlusal constraints, malocclusions (occlusal overload, bruxism) and/or too much loss of substance, excessively stained teeth, for patients who smoke and have poor hygiene, weakened periodontium with major malpositions.

Preconditioning:

Tooth whitening: Whitening can involve both the teeth intended to receive the veneers and the adjacent or antagonistic teeth, and should be performed six to eight weeks before the veneer preparation and impression.

Simple gingivoplasty: Gingivectomy or coronal elongation can be performed if indicated at the time of the clinical analysis. When the correction is minimal, the preparation, the impression and the temporary prosthesis can be considered concomitantly with the gingivectomy, otherwise it seems preferable to leave a delay of 2 to 4 weeks in order to obtain a first gingival maturation.

Clinical procedure:

• **Depth of Preparation Management:** The preparation is based on controlled penetration techniques. Natural anterior teeth have an enamel thickness that varies, depending on the corono-cervical position, between:

- 0.3 and 0.5 mm in the cervical third.
- 0.6 and 1 mm in the medial third.
- 1 and 2.1 mm in the incisal third.

The final morphology of the restoration made of a wax-up which is used as a basis for the realization of putty silicone index, the aesthetic mask (Mock-up) and the temporary veneers.

Dental burs: Diamond dental burs must be used. The depth marker burs for controlled penetration are used to make horizontal grooves. They are pushed in until the tooth touches the chuck.

Silicone index: The silicon index, made from duplicate plaster model, is used to evaluate the depth of the preparation and to control the reduction

Preparation through the aesthetic mask: This method was proposed by G. GÜREL who combines both the concepts of minim reduction, and the use of burs with stops that can allow a controlled preparation.

The clinical procedure is based on three successive phases:

- **Phase 1:** Aesthetic project and wax-up: this analysis concludes with an initial proposal that constitutes the direct mock-up. After validation, a more detailed wax-up will be made and then duplicated in plaster and recorded via a thermoformed gutter.
- **Phase 2:** Realization of the aesthetic mask (mock-up): During the following session, the impression is filled with temporary bis-acryl composite, then inserted in the mouth over the teeth to realize the indirect aesthetic mask (indirect mock-up). Once the resin is cured, the impression is removed and preserved for preparation and temporization steps. The aesthetic mask covering the patient's teeth allows the validation of the adopted aesthetic project.
- **Phase 3:** Preparation through the esthetic mask: The preparation begins with the depth marker burs. The final thickness of the veneer guides the choice of the size of these rotary instruments. Two or three horizontal grooves are made depending on the convexity of the tooth.

Preparation Limit: In most of cases, the cervical margin should be situated supragingivally, following the gingival festoon. In cases of severe dyschromia, it is preferable to bury the border in a slightly infragingival situation. The proximal margins are made with the same bur used for the cervical margin. Preservation of the contact surfaces is desirable when compatible with the aesthetic project.

- **Convexity of the vestibular surface:** The vestibular reduction is intended to be homothetic over the entire height in order to provide a homogeneous thickness of ceramic by orienting the burs along the axis of the tooth.
- **Occlusal contacts:** The preparation margin is usually placed above the occlusal contacts in IMO.
- **Finishing:** The preparation is smoothed with fine-grained (red) and then extra-fine (yellow) burs. The extra-fine burs can be replaced by hemispherical ultrasonic inserts.

Type of veneer preparation

Window preparation: This preparation is exclusively on the vestibular surface with a reduction value between 0.3 and 0.5 mm. The incisal edge is completely preserved.

This preparation is indicated when the incisal edge is thick without modifying the vertical and transversal direction of the tooth. This is the most conservative preparation. However, the complete preservation of the incisal edge does not allow to mask important dyschromias.

Preparation with reduction of the incisal edge without palatal return (butt margin): In this type of preparation, we start like type I, but with a reduction of the incisal edge from 1.5 to 2 mm (butt margin) without a palatal chamfer.

Preparation with incisal edge reduction and palatal overlap: The incisal edge is reduced by 1.5 mm and part of the palatal surface is included in the preparation. The rest of the preparation is similar to window preparation in the last two types of preparations, it is possible to modify the shape of the tooth in terms of height and width and also allows to mask the dyschromias.

No-prep veneers: In this type of restoration, the veneer is bonded directly to the buccal surface without preparation. The most common problems with this type of veneer are: encumbrance, cervical and proximal overcrowding, incorrect marginal adaptation, gingival irritation, imprecision during veneer placement and uncertain bonding.

Impression: Following tooth preparation, the final impression must be taken. Even though the preparation margins were at the gingival level, a retraction cord was used in order to capture the tooth surface beyond the margins.

This ensures accurate and complete capture of the entire margin and helps the dental technician in obtaining the correct cervical profile for the restorations. An impression was taken using a well-designed custom tray and a single stage impression technique. Polyvinyl siloxane impression material was used, with heavy body material placed in the tray and light bodied material syringed around the teeth.

Temporisation

There are two methods of realization:

- **Direct method:** This is the most commonly used technique; these temporary veneers will be obtained by isomolding from the same impression that was used to make the aesthetic mask.
- **Indirect method:** It is the preparation of the temporary veneers, from the aesthetic wax-up, by providing a repositioning key to the clinician.

Bonding

- **Preparation of the operating field:**

Place all the elements in an ergonomic way: patient in a lying position, the dentist in a midday position. The bonding composite and the instruments are within the reach of the dentist hand.

The veneers arranged in a well determined order to facilitate their location. Isolation of the prosthetic field with a rubber barrier system is obligatory.

Preparation of the veneers:

- Etch the intrados of the veneers with hydrofluoric acid, depending on the ceramic used.
- Rinse the veneers thoroughly, avoiding any manual contact with the intrados, then dry.
- Neutralize the acid residues with a US bath or sodium bicarbonate.
- Apply silane coupling agent to the intrados of the veneers.

Tooth preparation

- Clean the dental surfaces with a rubber cup mounted on a counter angle.
- Etch the dental substrates with orthophosphoric acid for 20 seconds.
- Rinse thoroughly for one minute, then dry moderately.
- Apply adhesion promoter to all prepared tooth surfaces.

Bonding

- Apply the chosen composite to the intrados of the veneer. Gently place the veneer, starting with the anterior veneers.
- Light-cure the veneer for a very short time (5 sec).
- Remove excess composite.
- Continue the light-curing on all the faces of the tooth.

Finishing

- Remove excess composite with a sharp instrument. Continue with very fine grit burs. Special attention should be paid to the cervical area.
- Floss interproximally, check that it does not stick.
- Check the occlusion in maximum intercuspitation and during mandibular excursions.
- -Distribute the guiding loads to as many anterior teeth as possible.

DISCUSSION

A direct composite is less expensive, easy to repair and with acceptable esthetic results in the very short term: a clinical study (21) on patient satisfaction shows no significant difference between direct composites and ceramic adhesive restorations (CAR) immediately after placement. However, two years later, a significant difference was observed, CAR achieving the best results. Secondary discoloration of composite resins is often described and can be prevented in the longer term with ceramic mini-veneers. Veneers no-prep do not have many advantages and are not recommended for the following reasons: On the one hand, unprepared enamel is not as favorable for bonding, since the most superficial layer of the enamel, the so-called aprismatic layer, offers reduced adhesion values for the bonding polymer. On the other hand, it is important to have a preparation limit (even a very slight one). The analysis of the literature on this subject (19) indicates that the absence of limits can create problems of a prosthetic nature such as the appearance of cervical and proximal overcontours with poor marginal adaptation, gingival irritation and inaccuracy during the placement and bonding of the veneer. This aesthetic project, which does not alter the shape of the

tooth very much, may not hide all the stains because of the thin ceramic layer at the incisal edge. The literature review shows that the low tensile strength of ceramics can affect the clinical success of veneers when used for diastema closure. This is due to increased stresses in the extension of the ceramic from the tooth structure to the interproximal surface. The authors note a progressive increase in stresses within the veneer extension(s) as the extension width, angulation, and stress value are increased. In contrast, there is a significant decrease in stress when both mesial and distal faces are restored compared to a mesial face only. This is due to the fact that the stress is distributed over a larger area. Although this study was conducted for veneers and not mini-veneers, it can be assumed that since the prepared surface area is smaller in the case of hemi-veneers, the stress will be distributed over an even smaller bonding surface, which can only worsen the stress distribution at the ceramic extension. Veneers and mini-veneers can be used to close diastemas, but critical factors such as width of extension, angulation and amplitude of forces can increase the risk of ceramic fracture. Thus, patients with wide diastemas, unfavorable tooth inclination or parafunctional habits are at risk for this type of indication.

CONCLUSION

Prosthetic treatments with bonded veneers have become reliable for simple or complex clinical situations thanks to the important developments of the last 20 years. Numerous studies report success rates of more than 95% after 10 years. Veneer preparations make it possible to respect the essential principles of tissue economy (minimal preparation of the tooth, respect of pulp vitality). Veneers are therefore the treatment of choice for anterior teeth with coronal alterations or malpositions that can be unsightly. They are used in specific clinical situations: minor tooth decay, non-traumatic occlusal relationships, satisfactory oral hygiene and absence of periodontal pathology.

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