Inlay, Onlay: Indication and Principale of Preparation

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Abstract

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 but also in terms of durability and longevity.

Keywords: Minimally invasive; Veneerlays

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 but 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 restorations, particularly inlays and onlays, require a good mastery on the part of the practitioner, a rigorous and difficult preparation and bonding, and their indications remain poorly known. 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 restorations 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, on the one hand, by a student in the Faculty of Dentistry of Casablanca (S.E.) and controlled on the other hand, 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 R.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...
- Evaluates the type(s) of minimally invasive restorations based on approved statistical, mechanical and biological tests.

Results

Definition

Inlays-onlays are indirect dental restorations assembled by bonding to restore a loss of tooth substance. Classically, an inlay is described as an incrustation in the tooth without a cuspidian covering. The term onlay is used when the prosthetic part provides a cuspidian covering (Figure 1).

![Figure 1: Inlay-onlay (33).](image)

Indications and contraindications

These restorations are indicated for:

- Site 1 and/or site 2 lesions in stages 3 or 4 (in the SiSta classification), damage to one or more cusps, as well as destruction of axial anatomies (vestibular or lingual) by more than one third.
- Endodontically treated teeth in which the cavity has compromised strength and prognosis can be filled with an inlay onlay.
- Replacement of old metal or composite fillings that are unsightly.
- Coronal reconstruction of a tooth with one or more cracks to include it in the restoration, the adhesive technique allowing to reinforce the natural structures of the tooth. However, the vital prognosis of the tooth should not be at stake and deep vertical mesio-distal cracks for example require a different treatment.

This type of restoration is very challenging, especially with the bonding step. We can therefore note some contraindications:

- Unmotivated patients with poor hygiene.
- High cario-susceptibility.
- Difficulty of access to the cavity, which will be a problematic for preparation, impression and cementing under dam.
- A small cavity, e.g. for an inlay, is relatively unsuitable for a ceramic material because it requires a high minimal thickness. A composite material is preferred in this case.

Principles of prosthetic fabrication

The preparation of teeth for ceramic inlays differs from the preparation of metal inlays in that it has axial walls with a taper of about 10° and a very wide isthmus (not less than 2 mm for a molar) with rounded angles.

The occlusal impact points should be located at a distance from the tooth-material joint.

The peripheral finish can be quarter round or right.

It is indicated in case of sufficient depth of the cavity, in the absence of interfering occlusal contacts with an aesthetic rendering superior to the 90° edges. However, the straight finish is generally adopted for mechanical reasons, and ease of realization in the laboratory (Figure 1).

Special considerations for the preparation of teeth for ceramic onlays

The veneer requires a minimum of 1.5 mm occlusal space and all cuspidian angles must be rounded and the margins must have a shoulder shape with a rounded internal angle or a wide chamfer.

The preparations should have a minimum ceramic thickness of approximately 1.5 mm to 2.5 mm. The cavity can be flat-based if it is deep enough or V-shaped in relation to the central pit to increase the thickness of the restoration for mechanical reasons.

During the second session, the removal of the temporary fillings and the complete cleaning of the cavity are done with an excavator, a probe, a sound or ultrasound insert followed by an air-polishing spray.

The restorative try-in follows the rules for prosthetic restorations (proximal contact point, marginal adaptation, shade, anatomical shape). Occlusal contacts will only be checked after bonding or with the use of a low viscosity silicone to avoid fracture of the element.

Discussion

Different types of ceramics exist actually. The shaping processes vary according to the material used. There are few studies evaluating inlays-onlays made of laminated feldspathic ceramics. The results are indicated in the medium term (6 years), which does not allow us to conclude on their clinical performance. For pressed ceramic inlays-onlays, the results are satisfactory with survival rates of over 90% at 6 years and over 80% at 12 years. For
CAD/CAM* inlays-onlays, the results are satisfactory with survival rates of 90% for follow-up periods of over 10 years.

**Longevity of inlays-onlays**

The factors influencing the longevity of partial restorations can be grouped into 3 major categories:

- Patient-related factors
- Practitioner-related factors
- Material-related factors

It is difficult to correlate the influence of these different factors on the longevity of the restorations, but it appears that the factors that cause an early complication of the restoration would be related to the practitioner (experience, respect of the indication, dexterity and respect of the clinical procedures) whereas the longer-term complications would be related to the patient and the material.

In their study (26), Weill et al. attempt, through an analysis of the international literature published between 2000 and 2013, to understand the factors influencing longevity in inlay/onlay restorations. It is therefore interesting to analyze these publications in order to compare the different survival rates of composite and ceramic bonded partial restorations.

The study of longevity requires the analysis of survival rates and success rates, which must be differentiated and defined: "The success rate: it is defined precisely according to its own criteria or according to a qualitative scale (e.g. modified USPHS). This diversity of qualification of "success" makes it difficult to compare between studies that do not use the same reference. This is why in the following studies survival rates will be compared. However, when it is well defined, this success rate is more representative of reality, because it is more demanding than the survival rate.

Survival rate: indicates the proportion of restorations that are retained in function without modification (repair, replacement of the restoration or avulsion of the tooth). It does not give any indication of the quality of the restoration in place. It is therefore interesting to compare the longevity of composite and ceramic inlays/onlays through the various studies listed in the work of Weill et al.

**Conclusion**

We have been able to recall that posterior bonded partial restorations can be made with different materials. Old materials and new materials such as composites or ceramics, which lead us to use adhesive techniques. These methods are the beginning of a new dentistry based on tissue economy, biocompatibility, mechanical resistance and aesthetics.

These restorations have several advantages:

- The evolution towards minimal preparations which is less mutilating for the dental organ.
- The filling of undercuts with a dentin substitute which allows to reduce the preparation volume.
- Bonding, which offers a strong adhesion to the dental tissues as well as to the prosthetic substrates, allows a mechanical reinforcement of the tooth and guarantees the durability of the restoration. Biomechanical failures are rare and re-intervention is easy.
- They cause fewer periodontal problems
- They integrate perfectly into the oral environment due to the new aesthetic materials and the possibility of characterization.

In addition, these restorations can be an alternative to coronal-peripheral preparations in depulped teeth. If these teeth have sufficiently strong walls and moderate loss of substance, it is preferable to opt for an inlay/onlay.

**References**


