

## Veneerlays: A suitable Conservative Approach for Restoring Posterior Teeth

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**ABSTRACT:-** To work with cosmetic dentistry involves having extensive knowledge about restorative alternatives on the materials and techniques of manufacture [1]. Several modalities are presently available to address the challenge of restoring posterior teeth which presently requires not only to restore esthetics, but also its structural preservation. Among this new esthetic approach, we had to deal with the Veneerlays. Two cases report are describing the protocol for preparation and bonding steps by steps of a veneerlay, which brings an esthetic alternative to restoring the maxillary premolar teeth. A six month follow up of the cases has shown a successful outcome. However, the success of a clinical procedure involves establishing the whole treatment protocol correctly, ensuring that each step should be done properly and respecting actual recommendations.

**Key words:** Veneerlays; Posterior teeth ;ceramics; composite; case report;

### I. INTRODUCTION

During the last 30 years, the evolution of concepts made the mainstay of dentistry. A new era of restorative dentistry has begun. In fact, nowadays, full coverage crown which was a common procedure, is considered outdated, practice has moved out of the classic era of dentistry to a more conservative era, favoring minimally invasive partial restorations. According to recent studies, less -aggressive tooth preparation is more predictable, as it is less traumatizing, the more we prevent tooth tissue loss, the less postoperative discomfort will be experienced by the patient.

In addition, minimally invasive techniques not only ensure biological and biomechanical requirements but also improve esthetic results substantially.

These procedures are becoming simpler as conservative tooth preparation and restorative procedures are now possible thanks to the development of both ceramic technologies, CAD/CAM systems in particular, and bonding materials.

Enhanced bonded ceramics (such as leucite and lithium disilicate based ceramics) have made it possible to produce greatly esthetic restorations with high biocompatibility, and optimal mechanical properties, which can be indicated, as a consequence, safely even for posterior teeth.

Many restorative modalities are proposed such as a classification of treatment options from the less invasive to the most invasive presented by Tirlet and Attal [2] or the famous concepts "no post, no crown" or "get bonded" by Pascal Magne[3] which are inspiring.

Several designs may be indicated, depending on the coronal dilapidation, such as the Veneerlays.

The Veneerlay is defined as an indirect bonded partial restoration indicated on the cusped teeth preferentially the maxillary premolars. It includes the vestibular cusp which can be discolored or disfigured and has to be covered. It combines an onlay, an overlay or an inlay onlay with a vestibular veneer by performing a veneerlay.

It seems to be an easy task but it requires knowledge of meticulous adherence to the clinical protocol and adhesive principles.

In the present paper, we present two case reports illustrating ceramic veneer lays fabricated by different methods.

## **II. Case presentation1:**

**Diagnosis:** A 30-year-old male patient presented to the Department of Prosthodontics at CHU Farhat Hached in July 2017 for treatment of a fracture on the distal-side marginal ridge of the right-side maxillary second premolar (#15). (Figure1).

Through the pulp vitality test, we determined that the vitality of this tooth was negative, and the patient reported no pain. He only complained of food impaction between the adjacent teeth.

An x-ray examination of #15 revealed secondary caries on the mesial side. The supporting bone was intact without periodontal ligament widening or an apical lesion.

After we removed carefully all of the carious tissue in order to preserve as much sound dental tissue as possible, we realized the endodontic treatment. (Figure 2).

Based on clinical and radiographic findings, various treatment options were discussed with the patient from direct composite restorations to full-coverage crowns. Patient was interested in aesthetical durable restoration.

Since he presented a favorable occlusion and an acceptable level of oral hygiene, he seemed to be a convenient candidate for an all ceramic restoration such as the veneerlay.



**Figure 1 Initial situation**

**Figure 2 Post-endodontic periapical xray of tooth 25.**

## **Clinical procedure**

### **1-First visit**

After removing all of carious tissue and realizing the endodontic access opening, under rubber dam isolation, we faced a compromised and weakened buccal cusp. In that manner, this cusp had to be overlaid. Since it is visible on smiling, we decided to realize a veneerlay.

In order to realize this veneerlay, we had to do a compound preparation (Figure 3):

#### **\* An occlusal and proximal preparation type inlay onlay:**

First, we managed the cavity respecting adequate preparation dimensions: a minimum of 1.5–2 mm of pulpal floor depth, 1–1.5 mm of axial reduction, and 2 mm of isthmus width.

We made a cervico-occlusal axial wall convergence of 10°–12°. And, we eliminated undercuts.

Then, in order to ensure the durability of the joint, we made the limits of the preparation further away from the occlusal impacts. And to allow sufficient occlusal ceramic thickness, we reduced 2 mm of the occlusal surface of buccal cusp and prepared 1 to 3 mm below the lingual cusp tip.

Finally, to avoid internal stress, we made sure that tooth preparation edges were perfectly rounded with no sharp angles.

#### **\* A vestibular preparation type veneer**

We prepared the facial surface with a light chamfer just at the gingival level (this chamfer may be lowered to 0.5 mm below the gingival crest late with discolored teeth).

An overall reduction of 0.6 mm was performed.

A complete arch impression was made with a silicone impression material (HydroC, Detax, Germany) (a combination of heavy -low and light silicon ) (Figure 4). Then it was transferred to the laboratory to be casted (Figure 4). The shade was determined with a shade guide (Vitapan 3D Master).

A temporary veneerlay was elaborated by isomoulage technique using a silicon index and autopolymerized resin (Texton:SS White, Ce 0473, Prima Dental Group, England) and cemented with temporary non eugenol cement (Temp Bond: Type I Class 1Ce 0086, Kerr, Italy).

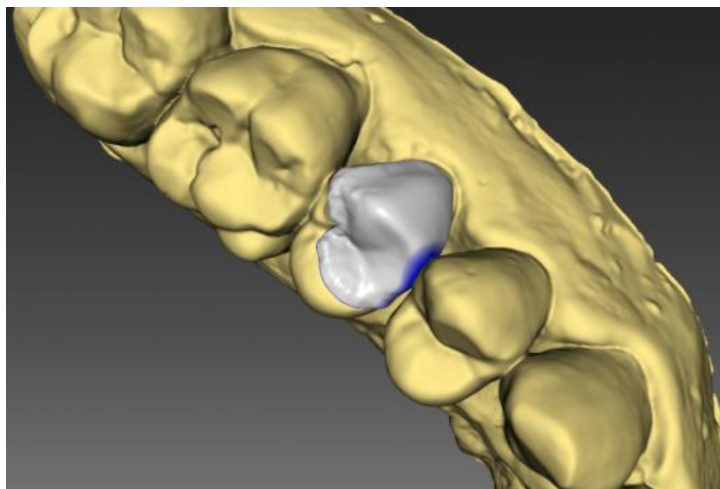
In laboratory, the ceramic veneerlay was manufactured using the CAD/CAM technology (Figures 5). It was done with Suprinity® block (from VITA) (Figure 6).



**Figure 3: After veneerlay preparation**



**Figure 4: Arch impression.**



**Figure 5: CAD/CAM procedure design of the veneerlay.**

## **2-Second visit**

\*For a secure bonding, the use of rubber dam was necessary.

We used a chairside-fabricated positioning stent (Figure 7), to simplify and quicken the luting of our indirect restoration (Figures 3)

This easy and practical method offers us many advantages:

- \*it's an effective way of grasping
- \*it protects the external surface from etching effects
- \*it provided precise seating of the restoration as on the cast model.
- \* removing the luting composite excess was easy.
- \*Also, minimal occlusal adjustment was needed.

The treatment of ceramic surfaces starts with the etching of internal surface of the veneerlay with hydro fluoric acid. Silane coupling agent was then applied.

When it comes to conditioning teeth surfaces, the prepared surfaces were first cleaned using chlorhexidine. Second, it was etched for 15 sec using 37% phosphoric acid and then rinsed off .

Third, it was coated with bonding agent in thin layer and polymerized for 15 seconds.

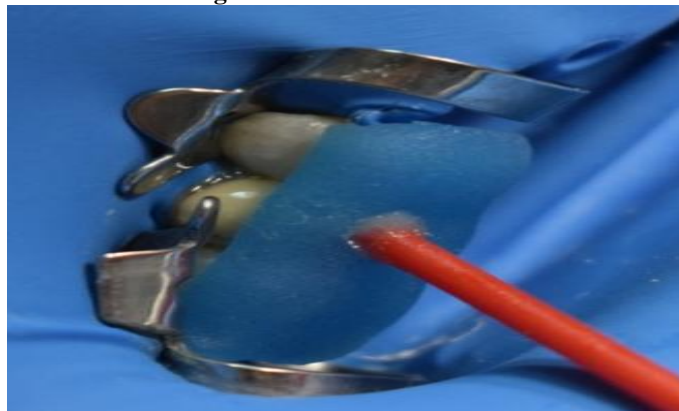
Finally, resin luting agent was applied to the restoration and the preparation. The restoration was seated and excess luting material was removed.

Light curing was then done in accordance with the resin luting manufacturer's recommendations

The occlusion was checked and the patient was instructed regarding adequate oral hygiene (Figures8).



**Figure 6 : Final restoration**



**Figure 7 : The veneerlay is positioned using the stent.**



**Figure 8: Final result**

### **I. Case Presentation2:**

A 29 year old male patient came to the Department of Prosthodontics at CHU Farhat Hached in September 2017.

Her chief complaint was to restore the right side maxillary first premolar (#14). (Figure 1).he was presented a favorable occlusion and an acceptable level of oral hygiene.

After we removed carefully all of the carious tissue, we realized the endodontic treatment. Thorough clinical examination and with the patient consent, we have decide to realize a ceramic veneerlay on the 14.

For that, the tooth was prepared with respect of guidelines of ceramic partial restorations (Figure 2). Then, a simultaneous double mixed impression was made using light and heavy silicon.

In laboratory, working cast was performed and scanned. The restoration was designed and milled by CAD/CAM, It was done with IPS E Max CAD® block (from Ivoclar Vivadent) (Figure 11).

Finally, for a secure bonding, the uses of rubber dam, using a self-adhesive and self-etching resin Totalad (Figure12) were necessary. Moreover, it was important to respect manufacturer's recommendations.



**Figure 9 Initial situation**

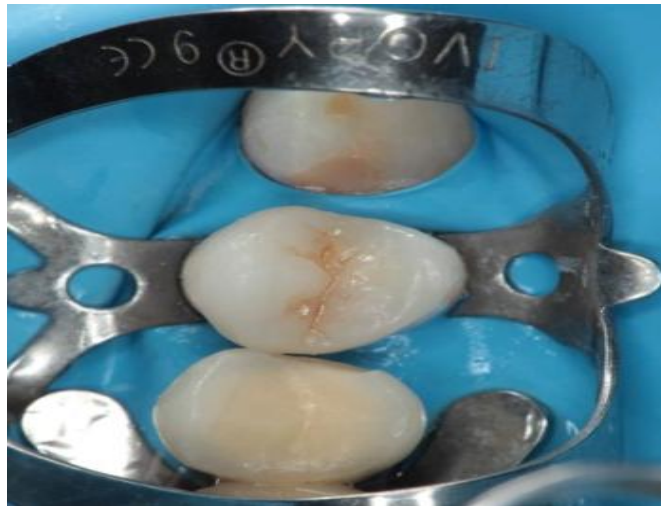


**Figure 10 the tooth prepared for a veneerlay.**

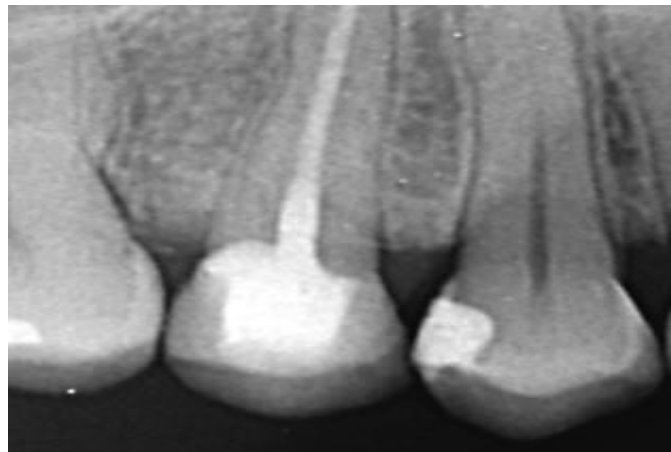


**Figure 11 Final restoration**





**Figure 12: Buccal view of the seated veneerlay after completion of composite light curing and after occlusal check**



**Figure 13: Postoperative radiograph.**

## **II. DISCUSSION**

Various modern restorative alternatives are currently available to restore teeth with moderate coronal defects in the posterior region of the dentition.

\*With the advent of adhesively bonded restorative materials which have superior esthetics, higher strength, and increased mechanical reliability, the proportion of restorative treatments in posterior teeth using cosmetic materials is rapidly growing. [4]

\*To satisfy both functional and esthetic demands of patient, a partial coverage restoration like the veneerlay can be indicated .

Veneerlays would be an excellent restoration option rather than using a full coverage crown.

\*Accordingly, we must master and strictly respect the protocol designed to overcome the challenges of the preparation, the temporization, and final bonding of this innovative restoration.

To achieve the success of this restoration, we have to be aware of several specific recommendations concerning:

### **\*Preparation Design:**

The occlusal preparation would be similar to an inlay onlay preparation or an overlay preparation, according to common guidelines. The choice of either option depends on the clinical situation.

If we choose to realize an inlay onlay preparation, it should have smooth flowing margins. Bevels are strongly contraindicated.

Undercuts should be avoided. Box walls should converge in an occlusion direction which facilitates optical capture.

Moreover, the limits of the preparation must be remote from the occlusal impacts in order to ensure the durability of the joint.

In order to achieve a balance between the preservation of tooth structure and strength of the material, authors concluded that the idealized inlay onlay preparation design requires a cavity depth of between 1.5 and 2 mm; isthmus width of 1/3 the intercuspal distance; a cervico-occlusal axial wall convergence about 20° and occlusal reduction at least 2 mm is recommended [4,5].

Finally, tooth preparation edges should be rounded with no sharp angles to avoid creating internal stress in the crown.

Otherwise, the preparation for overlay would include both buccal and lingual/palatinal cusps. It can also include a cavity preparation, which would be prepared with rounded internal angles, with a divergence of 6-15° between the walls and margins with 90° cavosurface.

\* The vestibular preparation would be similar to a veneer preparation.

The facial surface should be done with a minimal tooth reduction of 0.6mm should be performed on the facial surface. We should use a special diamond burs type light chamfer or rounded shoulder that would ensure preservation of sufficient enamel thickness.

The margins should be supra gingival for a secure bonding. (this chamfer can be lowered to 0.5 mm below the gingival crest late with discolored teeth).

**\*The interest of an immediate dentin sealing:**

During the temporization phase, for the pulped tooth, the immediate application of the dental adhesive (IDS) on the freshly cut exposed dentin, prior to impression making, has become in recent years a reliable and well-established clinical procedure.

This procedure makes it possible to protect the dentinal pulp organ from external contamination, thus preventing post operative sensitivity and reducing the risk of bacterial contamination. At the same time, this technique provides an ideal substrate for formation of a hybrid layer with increased adhesion strength as compared to that obtained with the delayed dentin sealing (DDS) procedure.

Thus, the use of a self-etching adhesive seems to be preferable given its low aggressiveness towards the pulp [6].

**\* Material selection:**

The Veneerlays can be fabricated from a number of materials, each of which has unique advantages and disadvantages. Current choices include:

**\*Composite resins** (e.g. Belle Glass proposed by Kerr):

Composite resins are used daily in clinical practice.

Initially, the composites were applied in direct restorations, but since the '80s indirect resin composites (IRCs) were also introduced in Dentistry [7]. The composition of indirect composite resin systems is similar to that of direct systems, differing by the use of different methods of additional polymerization, which allows a higher radical conversion. These additional polymerization procedures can involve photo-activation, heat, pressure, and a nitrogen atmosphere.

Several studies were initiated to assess the clinical performance of IRCs.

When compared to direct composites, their advantages are esthetics, color stability and reduced postoperative sensitivity. Additionally, it is easier to achieve ideal proximal contacts and anatomic morphology using indirect restorations. An important advantage of using this indirect restoration method is increased resistance to compression, increased surface hardness and reduced risk of fractures and cracks in the internal structure of the material.

On the other hand, Compared to ceramic materials, IRCs exhibit reparability, lower cost, ease of handling and better stress distribution, it plays the role of a shock absorber. But, they show inferior long term surface characteristics, such as surface roughness and esthetics and they are more prone to color changes. Moreover, under the effect of the high occlusal forces, resin undergoes a deformation and consequently transmits more constraints to the dental structure. This phenomenon may be at the origin of dental fracture.

Therefore, composite is specially processed to enhance its mechanical properties.

The world's first resin nano ceramic material, Lava™ Ultimate Restorative proposed by 3M ESPE is the unique hybrid material that offers the benefits of both glass ceramic and resin materials .

it is containing approximately 80 % (by weight) nanoceramic particles bound in the resin matrix. The ceramic particles are made up of different ceramic fillers that reinforce a highly cross linked polymeric matrix. The fillers are a combination silica filler and zirconia filler, (comprised of 20 nm silica and 4 to 11 nm zirconia particles).

this kind of resins is milled into dental restorations using the dental CAD/CAM system.

**\* Glass -matrix ceramics:** It represents the material of choice given its mechanical resistance, its biomimetics and its biocompatibility. [4]

In vitro studies suggest that glass -matrix ceramics may perform better in terms of adaptation to dentin, marginal adaptation, and cusp stabilization.

In vivo, it has been shown to exhibit superior restoration integrity and anatomic form, with less porosity and defects in comparison to conventional ceramics.

The restoration is therefore thanks to its rigidity, undergoes little deformation under the effect of the occlusal forces and it therefore tends to reinforce the tooth-restoration entity. However, it is exposed to a higher risk of fracture.

It is therefore beneficial to reinforce it using Lithium Disilicate or Zirconium dioxide (eg: SUPRINITY-VITA).

In order to ameliorate stress distribution and flexure of ceramic material, it appears an innovate dental hybrid ceramic (eg: VITA ENAMIC) .It has a dual network structure. In this dental material, the dominant ceramic network is strengthened by a polymer network, with both networks fully integrated with one another. In addition to a high degree of elasticity, this hybrid ceramic guarantees particularly high load capacity after adhesive bonding.

#### **\*Luting considerations:**

It is admitted, nowadays, that indirect partial restoration should be bonded. Bonding is a necessary condition for their longevity.

In fact, strengthening effect of adhesive luting been proved by several studies.

It provides additional reinforcement to both the restoration and the dental tissue. Effective adhesion achieved between the cement-restoration and cement-dentin interfaces conducts to an effective distribution of the occlusal forces along the restoration and dental structure [8]. Due to the elasticity of used resin cement, which tends to deform under stress conduction, resistance to fracture was improved.

In addition, the infiltration of resin creates a micro- mechanical retention of resin tags with the demineralized substrate improving in that order, the retention of the restoration. This means that, more the tubules widened by the etchant, the greater is the chance of obtaining a reliable bond [9].

For the choice of the luting systems, the resin cements with etch and rinse adhesives lead to more reliable results, they have a better marginal integrity.

Peumans et al. [10] in their study demonstrated that the prior enamel etching increased the bond strength of self-adhesive resin cement RelyX Unicem (3M ESPE, St. Paul, Minn) but had no significant effect on conventional resin cements Variolink II (Ivoclar Vivadent, Schaan, Lichenstein) and Panavia (Kuraray, Tokyo, Japan).

### **III. CONCLUSION**

Partial bonding restorations as **veneerlay** make an excellent alternative for posterior teeth when there is moderate remaining tooth structure. It allows a new esthetic approach due to its translucency and resistance without any weakening of the remaining dental element.

The possibility of elimination of the drawbacks related to the full coverage crown is the highest success of this conservative restorative procedure. However, long-term follow up and longitudinal clinical studies are needed to ensure their overall success.

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### **Conflicts of Interest**

The authors declare no conflict of interest.

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