Minimally invasive approach in prosthodontics: Prothesis with partial anchorage

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Introduction

Microdentistry or minimally invasive treatment is part of Minimum Intervention Dentistry (MID). It includes highly conservative clinical approaches, preserving maximum amount of oral tissue, and providing least invasive intervention [1].

Aim

The objective of this work is to highlight minimally invasive prosthodontic treatment. These are ceramic veneers, aesthetic inlay-onlays, and resin-bonded bridges that will be described and illustrated through clinical cases.

Materials and methods

The fixed prosthesis with partial anchorage is part of a conservative approach that optimizes the dental tissue economy. Minimally invasive treatment , as we present through case reports, allow conservative restorations that achieve aesthetic, biological, and functional requirements.

This is a case of a 28-year-old female who presented to the fixed prosthodontics service. She complained about un-aesthetic aspect of a Cl IV fracture of the central incisors restored with direct resin composite. An aesthetic diagnostic have led to the decision of using porcelain veneers to restore the structure tooth loss on the incisors, as well as improving their shade.

1.Initial aspect of the central incisors

2. Final result simulation by wax-up.

3. Teeth preperation

4. Lithium disilicate veneers

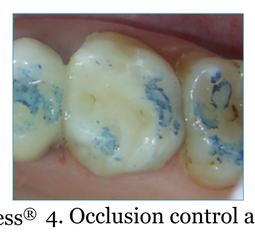
5. Veneers tried on and bonded with light-curing luting composite of a neutral shade.

6. Final smile result

This is a case of a 33-year-old male who presented with acute pain exacerbated by chewing food. The invistigation led to diagnosis food impaction between tooth #25 and #26 (#13 &#14). The main etiology is the inappropriate design of the marginal ridge and the contact area of the glass ionomer restoration. The treatment decision was a ceramic inlay restoration.

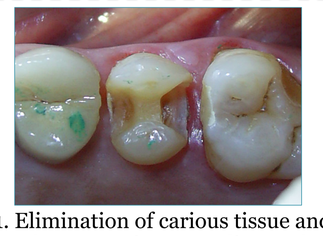
1. Initial restoration

2. Glass ionomer restoration removed, the preparation processed and resin provisional placed.



3. Inlay made of ceramic Empress® 4. Occlusion control after bonding and final result.

The inlays and onlays can be made of zircone by CAD/CAM procedure as it is the case of this inlay on the second upper left premolar.



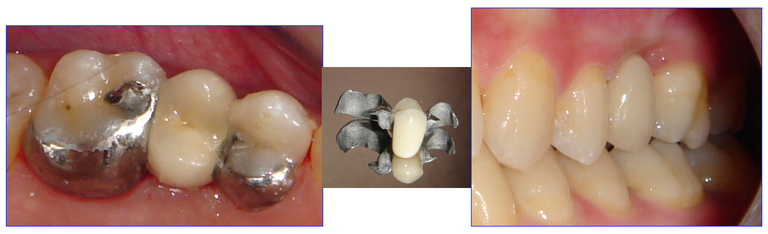
1. Elimination of carious tissue and tooth preparation according to the guidelines.

2. Aesthetic, and functional integration of the bonded inlay.

This is a case of a 24 year-old male who presented with single tooth loss (second upper premolar). With sound adjacent teeth, the therapeutic options were either implant restoration or resin-bonded bridge. Due to financial reasons, the patient chose resin-bonded fixed patial denture. Imprtant parameters were examined, space and alignment of abutment teeth, their endodontic, periodontal and occlusal conditions, and enamel suface area.

1. Initial case: Tooth #15 was extracted, and soucnd adjacent teeth.

2. Tooth minimal preparation (0,5mm) on palatal surface, and vertical grooves on pontic-side proximal surface



3. Occlusal and vestibular view of the final result of the restoration.

Alternative materials, such as ceramics, are used lately for more aesthetic outcomes. Tooth preparation is then adapted to the material properties.

1. All-ceramic resin-bonded bridge.

2. Bridge retainers may be wing or inlay designed.

Discussion

Minimally invasive dentistry was introduced to prosthodontics mainly because of the evolution of ceramics and the research , following the introduction of bonding by Buonocore in 1955, that led to the development of conservative adhesive techniques [2-3].

A porcelain veneer is a thin ceramic layer, which is bonded to the facial tooth surface, in order to improve anterior teeth aesthetics by changing their colour, form and/or position. A successful long-time result needs a careful planning and execution. The use of a diagnostic wax-up can assist the planning of the final aesthetic appearance and should incorporate all the desired modifications. It allows the manufacture of putty keys for mock-up, provisionals and reduction guide for the preparation process [2]. The tooth preparation offers more predictable esthetic resutls by providing enough thickness for the porcelain, a margin, and definite seating landmarks for the veneer [2,4]. The amount of tooth reduction (0,3 – 0,6 mm) depends on the chosen type of ceramics , the severity of tooth discoloration and/or misalignment. The overlapped incisal edge and the feathered incisal preparations are controversial. According to some studies an overlap design reduces stress concentration within the veneer. On the contrary some studies state that this design may promote ceramic cracks and will transmit maximum stress and thus increase the risk of cohesive fractures. [3,5] A no-prep approach can be used only for exceptionnal « additive » type esthetic cases in order to avoid overcountoured and bulky veneers. [4,5] The step of bonding may influence the final result. Thus, the choice of the composite resin shade should be careful and the procedure miticulously followed. The porcelain laminate veneers have several advantages such as : high aesthetic performance, sound enamel imitation, long-term shade stability, long-lasting, exceptional resistance to wear, abrasion and stains, biocompatibility, gingival health preservation. [3,4] Many studies have proven the reliability and sustainability of these restorations. A review of the literature about the performance of fully ceramic restorations reported failure rates for ceramic veneers below 5%, respectively 10%, after a 5-observation period and respectively 10 years.[5]

Ceramic inlays and onlays are the restorations of choice for lateral sector, due to their non-invasive approach, aesthetic, biological and mechanical performances, precise marginal fit and contact area restoration. Therefore they are used instead of direct restorations (amalgam, glass ionomer, composite) especially when aesthetics results are required. They are contraindicated in patients with poor oral hygiene, active caries, and excessive occlusal loading [6]. Certain principles of tooth preperation based on the properties of the used material have been suggested in the literature. For inlays, a minimum depth preperation of 1,5mm is required, minimally divergent walls, with no sharp angles and no chamfer preparation. For an onlay, a cusp preparation is added. These guidelines are followed after removing defective restorations and eliminating carious tissue [7]. The longevity and success of this type of restoration depend on the correct indication, an accurate work of the laboratory and the clinical experience [6]. Ceramic inlays and onlays have performed well in clinical situations. Neverthless, they are very technique sentisitve. Further long term studies are required in order to provide more evidence on rates of success.

Resin bonded fixed partial dentures are a minimally invasive option for replacing a single missing tooth which rely on composite resin cements for retention. These restorations were first described in the 1970s and have evolved significantly since then. The evolution concerned the abutment teeth preparation as well as the bridges design and material. The need of tooth preparation is a subject of debate[9]. Now, minimal preparation, within enamel is advocated. Vertical grooves have been identified as increasing resistance to debonding forces[10]. An extensive preperation can be justified only when teeth are restored[9]. About the design of resin bonded bridges, they seem to be more successful as cantilevers than as fixed-fixed restorations[9-10] .For more aesthetic results, alternative materials such as zirconia have emerged for retainers. However, further studies are needed about the longevity of restorations made form this material[10]. The estimated survival rate of resin bonded bridges after five years was 87.7%. The success of these restorations relies on careful case selection (space need to be restored, abutment tooth quality,bonding surface area), preparation of abutment tooth, controlled occlusal forces, and strict bonding procedure.[9,10]

Results and conclusion

Advances in micro-dentistry allow us to design so-called conservative prostheses which preserve the maximum residual sound dental tissues, while meeting the mechanical, biological, functional and aesthetic requirements of prosthetic restorations.

Porcelain veneers, inlays, onlays, and resin-bonded bridges, are aesthetic reliable restorations. Their success rely on accurate case selection, accurate work of the laboratory and clinical experience to respect each step of the procedure, from diagnosis to the bonding.

The collection of current knowledge about the different types of fixed prosthetic restorations called minimally invasive, broadens the range of therapeutic options and thus meet the requirements and demands of our patients who are increasingly targeted.

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