

Minimally Invasive Rehabilitation of Worn-Out Dentition- A Case Report

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Abstract:- Restoration of worn-out dentition often poses a challenge to clinicians. Tooth wear can be of various types i.e. attrition, abrasion, erosion depending on its cause, or any combination of these. Treatment involves a Multidisciplinary approach and evaluation of existing teeth, occlusal, functional, and esthetic factors. The development of adhesion to hard tissues of the tooth marked a watershed moment in dentistry, ushering in a new era. Enamel and dentin are the most commonly available substrates for adhesion in restorative dentistry. Adhesive dentistry is evolving in recent times which had led to the development of Minimal invasive dentistry. It is important for clinicians to recognize the early signs of worn-out teeth and can prevent further damage to the teeth through adequate treatment. In severe worn-out dentition, treatment involves full mouth rehabilitation restoring the compromised occlusal loss and aesthetics.

I. INTRODUCTION

The gradual tooth loss in the incisal and occlusal surfaces of the teeth is a normal process during a patient's lifetime. when there is excessive tooth loss that can result in sensitivity, pulpal exposure, occlusal disharmony, and Esthetically not pleasing¹. Tooth wear can be of various types i.e. attrition, abrasion, erosion depending on its cause, or any combinations of these². Therefore, it is important to remove the Factors that are responsible for tooth wear and restore them in the proper vertical dimension³, especially in bruxers which leads to failed restorations because of heavy occlusal forces. In many cases, VDO is maintained either by supra eruption of the teeth or by the growth of the alveolar bone⁴. Restoring the severely worn-out teeth is a challenge by conventional procedures i.e. full crowns that leads to more reduction of tooth structure. Nowadays these conventional procedures are replaced by minimally invasive procedures and esthetic dentistry.

The emergence of today's adhesive dentistry can be traced back to 1955, when Dr. Buonocore discovered that phosphoric acid could change the surface of enamel, making it "more receptive to adhesion." The development of adhesion to hard tissues of the tooth marked a watershed moment in dentistry, ushering in a new era. Enamel and dentin are the most commonly available substrates for adhesion in restorative dentistry⁵. In terms of adhesive procedures, the enamel is thought to be a relatively static and predictable substrate. Adhesive procedures for dentin are more complex than those for enamel, owing primarily to its chemical composition, moisture content, and regional morphological variation^{6,7}.

Because of improved aesthetics and minimal invasiveness, the use of laminate veneers has increased in recent years⁸. Enamel and silicate ceramic materials have similar mechanical and optical properties. As a result, this material is preferred for replacing lost enamel⁹. Due to its higher fracture toughness and biaxial strength than other ceramic materials, lithium disilicate ceramic material produces thin veneers^{10,11}.

II. CASE REPORT

A 56-year-old male patient reported to the Department of oral and maxillofacial prosthodontics and Implantology with a chief complaint of sensitivity while drinking water. A thorough case history of the patient was taken with proper clinical examination, there were generalized attrition teeth were seen in fig:1,2,3. and radiograph evaluations fig:4. The medical history was not significant. The patient was informed about the possible causes of his worn dentition, which included posterior interferences. The treatment plan was finalized after the patient's consent, which included the placement of ceramic veneers on anterior teeth and veneerlays on posterior teeth. The patient's vertical dimension at occlusion (VDO) is reduced so full mouth rehabilitation was planned with increasing the VDO. Maxillary and mandibular incisors were undergone a crown lengthening procedure.



Fig 1: Pre-Operative Photograph



Fig 2: Occlusal view of maxillary teeth



Fig 3: Occlusal view of mandibular teeth



Fig 4 : Orthopantomograph

Diagnostic impressions were made with putty and Diagnostic casts fig: 5,6 are mounted on a semi-adjustable articulator (Hanau articulator) using a face-bow fig: 7 and an Anterior deprogramming device (Lucia Jig) was fabricated fig:7 and the mandible is guided to the centric relation and interocclusal wax bite registration was made fig:8.



Fig 5,6: Diagnostic casts of maxilla and mandible



Fig 7: Lucia Jig



Fig 8: Wax record was made



Fig 9: wax bite registration

with the help of, this wax bite fig:9 the diagnostic casts were mounted on the articulator fig:10 on the articulator the premature contacts were identified and the bite was raised by only 0.5mm in the posterior teeth fig:11 causing the raise of the bite in the anterior teeth by 3mm fig:12. This is sufficient to achieve the proper anterior guidance. In this raised vertical

dimension diagnostic wax-up was done on both maxillary and mandibular cast fig:13,14

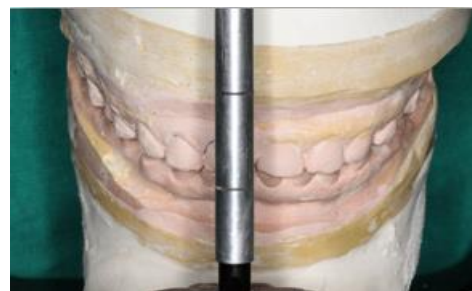


Fig10 : Premature contacts were identified



Fig11: Bite was raised by only 0.5mm in the posterior teeth and Fig12: Raise of bite in the anterior teeth by 3mm



Fig13: Diagnostic wax-up

After the diagnostic wax-up, the putty indices were made in the fig: 14 on the maxillary and mandibular casts these putty indices were used to fabricate the provisional restorations fig15 and fig16,17 occlusal view of provisional restorations. These Provisional restorations were kept for over two weeks. The patient was comfortable with these provisional restorations so we further planned the permanent restorations at this planned VDO. Once the compatibility in the new vertical dimension is confirmed with provisional restorations, permanent reconstruction were started.



Fig14- Putty indices of wax up for provisional restoration



Fig15- Functional and Esthetic Pre-Evaluative Provisional Restorations



Fig19: Tooth preparation for indirect veneers done on mandibular anterior teeth and a gingival retraction cord was placed.



Fig: 16,17- Occlusal view after placing provisional restorations

III. TOOTH PREPARATION

Before tooth preparation, shade selection was done using a vita shade guide and minimal tooth preparation was done by using porcelain veneer preparation burs. For the anterior teeth of the maxilla and mandible, tooth preparation was done for the anterior veneers. Three plane reduction in the gingival, middle and incisal thirds is the goal of facial preparation. The incisal reduction was not done as there was already a loss of tooth structure due to attrition. A supragingival Finish line was given. A retraction cord was placed for 5 min Fig18,19 and after that, it was removed and Polyvinyl siloxane (Aquasil soft putty/regular set, Dentsply, Germany) was used to make full arch impressions body. Maxillary and mandibular casts were poured in the laboratory and lithium disilicate veneers (IPS e. max CAD). After tooth preparation, interim restorations are given until the fabrication of veneers



Fig18: Tooth preparation for indirect veneers done on maxillary anterior teeth and a gingival retraction cord was placed

IV. VENEER CEMENTATION

Following the try-in of the veneers before and after glazing fig:20,21 veneers are prepared for cementation. Veneer cementation was performed individually for each tooth.



Fig 20,21: Try-in of maxillary and mandibular Veneers

1. **Preparation of veneer:** Conditioning the veneer with 5% hydrofluoric acid for 20 secs on the intaglio surface (porcelain etch) followed by rinsing under running water and air drying. After that silane coupling agent (Monobond N, Ivoclar Vivadent, Liechtenstein) was applied on the intaglio surface for 1 min.
2. **Preparation of teeth:** Etching of the prepared teeth by using 37 % phosphoric acid (Prime Dental Etching Gel) for 30 sec. Then dentin bonding agent is applied (Tetric N-Bond, Ivoclar/Vivadent, Schaan, Liechtenstein), and gentle air-drying and polymerization was done. Light cure resin cement was used to cement the veneer with the prepared teeth. All the veneers were seated on the tooth while applying light pressure. Tack cure was done and excess cement was removed with explorer and then luting resin was polymerized using a light-emitting diode for 30 s. fig 22 after completion of cementation a layer of oxygen barrier was applied (liquid strip; Ivoclar).



Fig 22 : Cementation of maxillary veneers

After cementation of maxillary and mandibular teeth veneers, the anterior guidance is achieved and then posterior teeth preparation was done for veneerlays. For veneerlays, only the buccal and the occlusal surfaces are prepared. Buccal surface preparation will be the same as veneers preparation

0.3 mm at the cervical region and 0.5 mm preparation at the middle third of the tooth and the occlusal surface is prepared flat fig 23. All the maxillary Posterior teeth are prepared first and cementation was done and then the mandibular teeth are prepared and then veneerlays were prepared and impressions were made and fabricated in the laboratory and then cementation was done. The cementation procedure was the same as for the anterior teeth.



Fig 23: Veneerlay preparation on the premolars and the 2nd molar and Molar provisional restoration was kept to maintain vertical height



Fig 24: Post-Operative Photograph in centric relation



Fig 25: Right lateral view



Fig 26: left lateral view



Fig 27 : Veneers of maxillary anteriors and veneerlays of posterior teeth

V. DISCUSSION

Minimally invasive dentistry has become increasingly popular in recent years. It is also known as micro dentistry, which refers to a variety of procedures that are all performed with the goal of preserving and improving the patient's oral health by providing a healthy tooth structure. The term itself –focuses on removing as little as possible of the tooth structure while also getting rid of the problem and improving the patient's overall oral health¹². With this MID Dentists offer the opportunity to reduce the need for future dental repairs by using long-lasting materials¹³. It not only prevents

common dental issues but also analyses and evaluates [iv]the potential risk and detects the problem at an early stage¹⁴. This minimally invasive dentistry is possible because of the advent of etching the enamel and the composition of enamel. Because of numerous advancements in restorative dentistry, the traditional "drill and fill" approach is fading. Adhesion is the primary requirement for a restorative material so that it can be bonded to enamel or dentin without the need for extensive tooth preparation.

According to Turner's classification, the treatment for the severely worn dentition is decided by the amount of space available after there is a loss of VDO. His classification and conventional treatment, which includes multiple crown-lengthening procedures to raise VDO, have been widely used till now¹. Furthermore, clinical decision-making is complicated by a lack of evidence regarding the long-term outcomes of treatment methods and materials¹⁵. The loss of anterior guidance, which protects the posterior teeth from wear during excursive movement, is facilitated by the severe wear of anterior teeth. The loss of a normal occlusal plane and a reduction in vertical dimension are also consequences of posterior tooth collapse. In the past, full crowns were used for the restoration of worn-out teeth, but this involves the reduction of the coronal tooth structure by almost 63-72% and that is considered an invasive procedure¹⁰.

This led to the development of minimally invasive procedures which involves the minimum amount of tooth structure is removed and there are advancements in the materials such as lithium disilicate ceramics due to its higher fracture toughness and biaxial strength than other ceramic materials, lithium disilicate ceramic material produces thin veneers i.e. 0.3-0.7mm thickness. Veneers can be used with minimal invasiveness Allows placement without tooth preparation¹⁶. Because of the ambiguous guidelines, adhesive strategies are more conservative, and reversible are becoming more popular¹⁷.

In this case report, full mouth lithium disilicate veneers are used for rehabilitation. This lithium disilicate can be either pressed ceramic or easy to trim blue intermediate phase (lithium metasilicate). Hahn et al. noticed that intact unprepared teeth were stronger than bonded porcelain veneers (Empress) placed on 0.5 mm deep buccal preparations. As a result, for adhesive bonding, minimal tooth preparation limited to enamel is recommended. A 0.7 mm labial reduction was performed in the present case^{18,19,20}.

According to Meijering et al., porcelain veneers have a 94 percent survival rate, while indirect and direct composite veneers have 90 percent and 74 percent survival rates, respectively²¹. Various other studies have found that bonded porcelain laminate veneers have a survival rate of more than 90% after a 10-year clinical service²².

During the cementation procedure, excess care should be taken to avoid saliva contamination, while conditioning the ceramic and prepared tooth and the resin cement used for cementation. The success of this bonding procedure depends on these factors. For the prepared tooth, etching can be done

with 37% phosphoric acid and a dentin bonding agent is applied and gently air-dried and cured. Conditioning of ceramic is done by 5 % hydrofluoric acid and silane agent is applied. This depends on the ceramic material which is used for bonding, depending on the duration of these is varied. By restoring the vertical dimension and improving the aesthetics and function, a satisfactory clinical result was achieved.

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