Reestablishment Of Vertical Dimension Of Occlusion With A 3D Printing Overlay Removable Partial Denture. A Clinical Report.

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Abstract

Occlusal disease is a common problem characterized by loss of vertical dimension. The features that show the damage are the loss of vertical dimension of occlusion, diminishment of facial profile, and fracture surfaces in the enamel of the rest of the teeth. According to Liu B, for Davarpanah M, the ideal treatment for occlusal disease includes a planning for each tooth involved in the masticatory function and this could be very expensive. However, Dr. Fonseca J, describes the overlay removable partial denture that offers an affordable option to minimize further damage to oral tissues, increase the vertical dimension of occlusion, and can be used as a relief for the muscles of mastication. Furthermore, the new technology of 3D printing and digital impression aid in the precision and esthetics of the overlay (Winter J, 1997). In this clinical report, a 3D printing overlay RPD was constructed to raise the vertical dimension of occlusion and establish a harmonious facial profile.

INTRODUCTION

The principles of occlusal disease describe that signs of occlusal wear always precede the symptoms. The damage caused to the oral tissues is continuous and more severe as time goes on. The signs of occlusal disease are: attritional wear, erosion of enamel, splayed teeth, sensitive teeth, anterior guidance attrition, sore teeth, hypermobility, teeth loss of proportions and ultimately loss of VDO. The mechanisms for tooth surface deformation, according to Grippo, is divided into three physical and chemical characteristics. First, stress that results from compression. Second, friction that leads to abrasion. Lastly, corrosion that is the result of chemical degradation (Palamara D,2001). If occlusal disease is left untreated, the loss of teeth is inevitable (Dawson,2007). The next step is loss of vertical dimension of occlusion. In order to recover the lost VDO, an intensive occlusal rehabilitation must be done. The best treatment in this situation is a wax up to design a new VDO that restores the facial profile and a harmonious stomatologic system. This could lead to very good results but is an expensive treatment.

The 3D printing overlay removable partial denture offers an affordable and precise option. This represents a technological advance that 3D printing is bringing to the world of dentistry.

In the information provided by Arburg, for 3D printing, it is described as a process of making a three-dimensional solid object of virtually any shape from a digital model. This process consists of adding layers of material in a pattern that will produce a design sent by a computer. This is also known as an additive technology (Zein, Hutmacher, DW).

In 2015 the author Espalin D, mentioned: “printing entirely finished dental prostheses and restorations with the push of a button seemed to come closer to reality”. That year the FDA approved the dental material to fabricate 3D printed dentures.

In the following case report, we utilized the 3D technology to increase vertical dimension of occlusion for our patients and provide satisfying treatment.

CLINICAL REPORT

A 65-year-old African American female came to the Department of Dental Medicine, Metrohealth Medical

Center in Cleveland, Ohio for treatment. Her chief complaint was difficulty breathing, pain in the jaw joints and she wanted to replace missing teeth. During clinical examination, findings were: 1.-lower anterior teeth occlude in the palatal mucosa. 2.- total loss of interocclusal space on right posterior mandibular edetulus region due to supra eruption of maxillary premolars and molars. 3. Loss of vertical dimension of occlusion.

Treatment options for such a case can be very complicated and expensive. Like Orthognathic surgery with maxillary advancement and mandibular setback, dental implants to replace missing teeth after orthognathic surgery, orthodontic treatment to achieve a more harmonious occlusion with dental implants, or fixed bridges. However, patient's limited resources did not allow any of these options. Therefore, an overlay RPD would be an exceptionally good option for this patient because it could fix the patient's dental deficiencies from our professional point of view. Patient agreed and the treatment started.

Figure 1

Treatment started by alveoloplasty of the lower right edentulous ridge to create enough space for the RPD. Alginate impressions were taken after healing. Special trays were fabricated for second impressions. Face bow bite was transferred to a semi-adjustable articulator. Scan of the cast was done with 3shape D2000 scanner system by the lab and a 5 mm increase of the VDO was achieved. Digital articulation was completed with 3shape Dental system. This facilitated an accurate measurement for the VDO. The dental laboratory fabricated a digital RPD for trial appliance.

The patient tried the appliance and occlusion was adjusted as needed. In this try-in visit several steps were accomplished. The first, bilateral occlusal adjustments until all posterior teeth were in occlusion. Second, the freeway space was changed from 8 mm to 4 mm. Third, lower anterior overlay was trimmed so as to not occlude with palatal mucosa. Fourth, canine guidance was considered and checked inside the patient's mouth. Lastly, a vinyl polysiloxane bite was taken for registration. All the recorded information was sent to the dental laboratory for the fabrication of the final RPD.

This step was completed with Dental CAD/CAM. The overlay RPD was delivered and seated. Patient experienced an increase in VDO and better facial profile. Also, the experience of masticatory overload distributed evenly, with this ability to chew and grind foods more efficiently. The result was better esthetics as lower teeth come to the smile and improvement in the patient's dental health.

Figure 2

Figure 3

Figure 4

DISCUSSION

There are many treatment options for increasing VDO, the ideal treatment in this case includes Orthognathic surgery and dental implants for edentulous areas. In this particular case a conventional overlay RPD has offered a treatment of choice for the patient. In a follow up within a year with this case, the patient stated she wears the overlay RPD constantly, although she doesn't use it to chew her food most of the time. Patient is happy with the esthetics that this RPD provides, and recommends this treatment than no treatment at all. Patient acknowledged and appreciated all the work and expertise that were used to fabricate this partial. She does feel it is a unique prosthesis.

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