

Evaluation of occlusal vertical dimension loss in worn dentition and their prosthetic rehabilitation; two cases reports

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Abstract

Tooth erosion is a common condition in humans and may be due to etiologic factors rather than bites. It is generally seen in individuals in vertical occlusal losses depending on the frequency and amount of tooth wear. In such cases, the physician should decide the appropriate treatment for the patient as well as the etiologic cause. In the first case, a 61-year-old male patient presented with insufficient chewing function and aesthetic complaints. Clinical examination revealed vertical size loss due to wearing. The upper anterior teeth were finished with metal-ceramic restorations crowns and the lower and upper posterior teeth with metal-ceramic restorations to increase the vertical size of the patient. In the second case, a 41-year-old male patient presented to our university with a low profile on his face and an aesthetic complaint due to the abrasion of the upper jaw anterior teeth. In this patient, the upper and lower anterior teeth were finished with zirconia crowns and the posterior teeth with metal-supported porcelain restorations to rearrange the vertical dimension. This study aims to present various prosthetic approaches that can be performed in worn tooth cases.

Keywords: Management options; occlusal vertical dimension; prosthetic rehabilitation; tooth wear

INTRODUCTION

Tooth wear is a life-long physiological process. It occurs as a natural result of aging. Wear in teeth is defined as the slow and sustained loss of material caused by a foreign mechanical agent or by an opposing tooth during occlusion and chewing. In other words, tooth wear is a disease characterized by loss of dental hard tissues without caries (1-2). Tooth abrasions are divided into four groups, depending on the factors that play a role in their formation, as attrition, abrasion, erosion, and abfraction. The attrition; Due to dental contact with the tooth without a foreign body, it means the loss of dental hard tissues and is mostly occlusal. There are two types of attrition, physiological and pathological. Physiological attrition occurs as a result of normal chewing function, it is usually worn that does not require treatment and continues throughout life. If there is more than average wear depending on the age of the patient, pathological attrition is mentioned. Pathological attrition defect may also be seen in the presence of premature contacts in patients with dental malposition and closure disorder. Some parafunctional habits may also lead to pathological attrition.

Bruxism is thought to be the leading cause of pathological friction. Clinically, the attrition is seen on both permanent and primary teeth, especially on the incisal and occlusal surfaces (2,3). Amount of wear on the teeth, age, sex, occlusal condition, parafunction, problems with the digestive system, continuous consumption of acidic fruits or low pH fluids, excessive vomiting disorders such as bulimia and Bartter's syndrome, may be caused by intrinsic factors such as amelogenesis imperfecta and dentinogenesis imperfecta (4).

Wear may also occur on the surfaces between the teeth. Dentin tissue may be exposed in severe attrition cases, which increases the rate of wear. When the wear exceeds the physiological limits, the enamel tissue disappears, and the erosion event can be accelerated as the exposed dentine tissue is less mineralized than the enamel (5). Abrasions; pathological abrasion of teeth as a result of abnormal mechanical factors are called abrasion. They can be classified according to etiology. According to this classification, toothbrush abrasion is the most common. As a result of improper use of the brush, it is seen as a V shape on the vestibule surfaces of the incisors, canines and premolar teeth. In addition to these, clasp abrasion, snail-eating habits, pipe users using pipe-related abrasion

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and abrasion in some occupational groups (shoemakers, carpenters, tailors, musicians) are seen. This type of wear can be confused with root surface caries, and radiography shows that the abrasion is a horizontal radiolucency with smooth borders that surround the tooth along the neck area (2). Erosion; It is the loss of dental hard tissues due to chemical reasons without a bacterial agent. It is seen as a full, flat, bright pit in the coronal region near the enamel-cement junction. In posterior teeth, occlusal surfaces are seen as a loss. In laboratories, erosions are frequently seen in those who are fed with acidic foods and working with acidic substances. External and internal factors may be mentioned in the etiology. Extrinsic factors describe wearing caused by food and drink, while intrinsic factors include several diseases. They are characterized by vomitings, such as anorexia and bulimia nervosa, with the introduction of gastric acid called regurgitation into the mouth due to some stomach diseases such as reflux (2,5). Abfraction; Occlusal loads in the structure of teeth as a result of stress caused by the enamel rupture that occurs in the collar of the tooth; they are seen in the form of wedges. As the defect deepens, the intensity in the internal structure of the tooth increases, and the anomaly deepens. Restorations may slow these lesions. The strength in the internal structure of the tooth may not be removed entirely, but the incoming stress is dissipated (2,3).

Factors Causing Occlusal Vertical Dimension Loss

Although prosthetic options are limited in the treatment of worn teeth, it is essential to provide a functional and aesthetic restoration to improve the life quality of the patient. Pathological erosion may be exogenous or endogenous in origin. Another cause of wear is the lack of lost posterior teeth. As a result of these erosions, losses occur in the occlusal vertical dimension. Occlusal vertical loss is a preparative factor for functional problems such as parafunctional habits, abnormal chewing pattern, bruxism, and craniomandibular disorders. Occlusal vertical Dimension loss also produces a chewing insufficiency and poor aesthetic results. Increased tooth surface loss results in the reduced occlusal vertical dimension, while reduced occlusal vertical dimension can lead to problems such as poor aesthetic appearance, reduced chewing effectiveness, pain in the temporomandibular joint, and loss of muscle tone.

With increasing lifetime, the number of patients who want to preserve natural dentition has increased, and accordingly, dentists have become important for most of the patients (6). For dentists, dental wear is a common frequently encountered in their vocational life. If this wearing does not lead to aesthetic and functional losses, only protective applications and follow-up appointments may be sufficient. Pathological erosions may be of exogenous or endogenous origin. The etiology of wear is classified as mechanical and chemical. Mechanical abrasions are called attrition and abrasions, while

chemical abrasions are called erosion (6). One of the significant causes of wear is the lack of treatment of the missing posterior teeth. These patients perform the chewing function using their anterior teeth, which results in the abrasion of anterior teeth. With abrasion of anterior teeth, these teeth are subject to occlusal forces, which are not at all resistant. This may cause pathological migrations. As a result of these erosions, losses occur in the occlusal vertical dimension (5,6).

Occlusal vertical dimension losses due to physical factors can be compensated by the eruption of teeth and alveolar bone growth. Severe erosion can cause morphological changes in occlusal surfaces of teeth, loss of occlusal vertical dimension, pulp pathologies, occlusal mismatches, and irregularity in chewing function. In such cases, there is a need for multidisciplinary treatment, including periodontology, endodontics, and prosthetic dentistry (7).

The reason for increasing the occlusal vertical dimension is generally increased due to aesthetics, tooth surface loss (wear), alteration of occlusal relationships, and preparation for prosthetic restorations. Aesthetic reasons are typically grown to ensure that the anterior teeth do not appear sufficiently and provide a younger appearance on the face. Occlusal vertical dimension loss due to losses on the tooth surface, depending on congenital anomalies (amelogenesis imperfecta, dentinogenesis imperfecta), parafunctional habits (bruxism, pen biting, pipe use), abrasion and erosion.

The occlusal vertical dimension should not be increased in patients with alveolar bones with muscle hypertrophies, increased bone volume, and marked antegonial notches.

Rehabilitation of Occlusal Vertical Dimension Loss

Treatment of tooth erosion should usually be presented at an advanced stage with multiple underlying factors that make diagnosis difficult and require a multidisciplinary treatment approach. Studies show, the need for prosthetic rehabilitation varies depending on the amount of occlusal wear. However, prosthetic treatment is not always necessary in cases of minor wear. In extreme occlusal erosions, occlusal changes in the vertical dimension and may cause pathologies in TMJ and masticatory muscles. In the rehabilitation of advanced occlusal vertical dimension losses, it is recommended that the patient be adapted to the new occlusal vertical dimension after temporary moving and/or fixed occlusal apparatuses and the permanent restoration is recommended (8).

The most effective treatment methods for the rehabilitation of the occlusal vertical dimension can be a surgical lengthening of crown lengths, orthodontic tooth movements, and prosthetic rehabilitation with a fixed or removable prosthesis. In increasing the occlusal vertical dimension; removable temporary prostheses, occlusal splints and fixed temporary restorations are being applied.

Preservation of the tooth structure in each restoration, whether or not occlusal vertical size is raised, is of great importance in maintaining the balance between biomechanical, biological, aesthetic, and functional parameters (14). Supportive approaches to healthy tooth tissue should be considered when choosing a restorative treatment method. In younger individuals and especially in the presence of small defects, composite restorations with less costly and minimally invasive procedures may be preferred. However, such restorations applied in the posterior region have many disadvantages such as abrasion, breakage, deterioration of the edge fit due to polymerization shrinkage, microleakage, formation of secondary caries, and sensitivity. The use of ceramic or composite indirect partial restorations to eliminate these drawbacks has become increasingly common (9).

Many different methods and different approaches are used in rehabilitating the occlusal vertical dimension with prosthetic treatment. Before increasing the occlusal vertical size, the patient should be evaluated in terms of surgical, endodontic, and then in terms of functional, phonation, and aesthetic prosthetic treatments.

Occlusion examination is supported by a specific oral pattern using alginate impressions and detailed oral analysis using a correct face pattern from a face-to-face transfer so that dental plaster models can be mounted on the articulator (10). Once the models mounted on articulator, it is possible to state the degree of tooth surface loss in more detail and to determine which teeth require restoration. The stages and purpose of the prosthetic restoration process should be defined. When deciding whether an indirect restoration can be achieved in patients with worn teeth, care should be taken to maintain aesthetic, occlusal stability and existing tooth structure. There must be two operating models mounted on the articulator. One of the models serves as the first record, and the second is used for proofing. For example, it can be used for periodontal treatment, occlusal adjustment, or wax-up in crown lengthening. Also, the approximate increase in the vertical dimension can be determined on the models.

When planning to increase the vertical dimension, the patient should first undergo temporary restorations to adapt the masticatory muscles and temporomandibular joint. Temporary restorations include removable temporary prostheses, occlusal splints, and fixed temporary restorations. These temporary restorations are used for six weeks to 3 months. After the adaptation of the joint and masticatory muscles, the permanent restoration is initiated (11).

CASE REPORT 1

A 41-year-old male patient was admitted to our university with a complaint of low profile on his face and abrasion of the upper jaw anterior teeth. Intraoral examination revealed severe erosion of all lower and upper jaw teeth due to bruxism (Figure 1).



Figure 1. Preoperative intraoral frontal view



Figure 2. Intraoral view of tooth preparation



Figure 3. Final prostheses. intraoral view

The resting vertical dimension of the patient was determined, the occlusal vertical dimension was measured, and the interocclusal distance was calculated (6mm). Alginate impressions taken from the upper and lower jaw of the patient and diagnostic models were obtained and transferred to a semi-adjustable articulator (Stratos 100-Ivoclar vivadent) using a facial arch (Ivoclar vivadent-Universal transfer). On this articulator, an occlusal splint of hard clear acrylic was prepared on the upper jaw to increase the patient's vertical size to 4 mm so that the interocclusal distance was 2 mm. The splint used for four weeks and the teeth were prepared for a fixed prosthesis (Figure 2). After making sure that there was no function and phonation problem related to the

vertical dimension of the patient, the treatment completed with canine-protected occlusion, upper and lower anterior teeth with zirconia crowns, and posterior teeth with metal-ceramic restorations. Aesthetic treatment applied because of the wear of the teeth due to bruxism (Figure 3). After the treatment was completed, the patient measured with alginate from the upper jaw and a transparent plate with a thickness of 1 mm prepared for the patient.

CASE REPORT 2

A 61-year-old male patient presented with a lack of masticatory function and aesthetic complaints. Intraoral examination showed severe erosion of all lower and upper jaw teeth due to bruxism and acidic foods (Figure 4).



Figure 4. Preoperative intraoral view



Figure 5. Final prostheses intraoral view

The resting vertical dimension of the patient was determined, the occlusal vertical dimension was measured, and the interocclusal distance was calculated (8mm). Alginate impressions were taken from the upper and lower jaw of the patient, and diagnostic models were obtained and transferred to a semi-adjustable articulator (Stratos 100-Ivoclar vivadent) using a facial arch (Ivoclar vivadent-Universal transfer). On this articulator, an occlusal splint of hard transparent acrylic was prepared on the upper jaw to increase the patient's vertical size by 5 mm so that the interocclusal distance was 2 mm. The splint used for six weeks, and the teeth were prepared for a fixed prosthesis. After the preparation, permanent, temporary restorations were made using acrylic material and the teeth used for

six weeks. When it ensured that there was no function and phonation problem related to the vertical size of the patient, the treatment was completed with canine-protected occlusion, the upper anterior teeth were finished with metal-supported porcelain crowns, and the lower and upper posterior teeth were finished with metal-supported porcelain restorations (Figure 5).

DISCUSSION

To indicate the relationship of the upper and lower jaw, the distance between the 2 points measured when the teeth are at maximum closure. The teeth continue to wear and wear for a lifetime. The stabilization of the occlusal vertical dimension level is also dependent on the balance between tooth wear and tear (12).

Treatment of excessively worn teeth is a complex and challenging problem for the physician. Early detection both facilitates treatment and reduces costs. However, it is often difficult to find such an ideal condition clinically. If tooth abrasions cause sensitivities in the patient, create aesthetic difficulties, and there is a risk of pulp release, the treatment approach should be considered (13). In cases where vertical dimension needs to be increased, occlusal splint application, temporary moving overlay prosthesis, or temporarily fixed restorations can be considered as the first step in the correction of the relationship between horizontal and vertical jaws. In this way, it is aimed to prevent pain in the muscles and joints and to acclimate the patient to the new vertical dimension. Wear may have decreased the crown length so as not to allow constant treatment, in which case crown length extension may be considered (13). Zanardi et al. (14), a removable partial prosthesis may be an alternative treatment for special cases involving partially edentulous arches in patients in whom the occlusal vertical dimension should be restored. In a study by Johansson et al. (15), They used cobalt-chromium splint for two months in a patient with excessive abrasion and then made permanent restorations with metal-ceramic restorations. In the same article, in another case, anterior riser temporary fixed dental prostheses were used for five months, and Empress crowns were applied.

Clinical examination plays a significant role in the evaluation of the occlusal vertical dimension. Phonetic, interocclusal spacing, swallowing, patient preferences can be used for accurate measurement of the occlusal vertical dimension. In order to increase the patient's vertical size by 5 mm so that the interocclusal distance remains 2 mm on the articulator, an occlusal splint was prepared from the hard transparent acrylic on the upper jaw. The occlusal splint was used for 6 weeks. After the adaptation was achieved by increasing the occlusal vertical dimension using the occlusal splint, the occlusal relationship of the patient was fixed by the metal- ceramic restorations in the first case. Besides, tooth sensitivity and esthetic problems due to abrasion in the lower jaw incisors were eliminated, and a distance of 4-5 mm was obtained. In the second

case, the restorations of these teeth were performed by using zirconia material in the anterior region to get the most relevant results in terms of aesthetics, durability, and biocompatibility. Because of these procedures, when the teeth were in the centric occlusion position, a distance of 3-4 mm was obtained between the alveolar crest of the upper jaw and the incisal faces of the lower jaw incisors.

CONCLUSION

Occlusal prosthetic restorations that will be performed in order to treat edentulism, provide function, fontion and aesthetics in cases where the teeth have erupted to opposed dental arch and the occlusal distance is insufficient due to abrasion, are the appropriate treatment options for the rehabilitation of such cases.

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