Research, Society and Development, v. 12, n. 4, e20512441255, 2023
(CC BY 4.0) | ISSN 2525-3409 | DOI: http://dx.doi.org/10.33448/rsd-v12i4.41255

Posterior restorations with composite resin in patients with corrosive wear – a clinical case

Restaurações posteriores com resina composta em pacientes com desgaste corrosivo – um caso clínico

Restauraciones posteriores con resina compuesta en pacientes con desgaste corrosivo – un caso clínico

Recebido: 29/03/2023 | Revisado: 07/04/2023 | Aceitado: 07/04/2023 | Publicado: 12/04/2023

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Abstract
For patients with loss of vertical dimension of occlusion caused by parafunctional habits associated with acidic food intake, care must be taken when choosing the restorative material. The composite resin besides being a low-cost material, is a material that has better indication for treatment not only for optimum comfort, but for increased longevity under study, providing better cost-benefit from the materials of choice. However, one should know well about conditioning, adhesion and composite resin, including finishing and polishing. The main objective of this research was to report a clinical case of a patient with loss of vertical dimension of occlusion caused by parafunctional habits. During the clinical case described in the article, we can analyze research that proves that the composite resin for posterior cases is better, especially when there are multiple cases of wear and parafunction, and we can also analyze the technique used and the predictability in the treatment, causing more comfort for the patient and the Surgeon Dentist.
Keywords: Composite resin; Vertical dimension of occlusion; Posterior restorations.

Resumo
Para pacientes com perda da dimensão vertical de oclusão causada por hábitos parafuncionais associados à ingestão de alimentos ácidos, cuidados devem ser tomados na escolha do material restaurador. A resina composta além de ser um material de baixo custo, é um material que tem melhor indicação de tratamento não só pelo ótimo conforto, mas pelo aumento da longevidade em estudo, proporcionando melhor custo-benefício dos materiais de escolha. Entretanto, deve-se conhecer bem sobre condicionamento, adesão e resina composta, incluindo acabamento e polimento. O objetivo principal desta pesquisa foi relatar um caso clínico de uma paciente com perda da dimensão vertical de oclusão causada por hábitos parafuncionais. Durante o caso clínico descrito no artigo, podemos analisar pesquisas que comprovam que a resina composta para casos posteriores é melhor, principalmente quando há múltiplos casos de desgaste e parafunção, e também podemos analisar a técnica utilizada e a previsibilidade no tratamento, causando mais conforto para o paciente e para o Cirurgião Dentista.
Palavras-chave: Resina composta; Dimensão vertical da oclusão; Restaurações posteriores.

Resumen
Para pacientes con pérdida de la dimensión vertical de la oclusión causada por hábitos parafuncionales asociados con la ingesta de alimentos ácidos, se debe tener cuidado al elegir el material de restauración. La resina compuesta además de ser un material de bajo costo, es un material que tiene mejor indicación de tratamiento no solo por un óptimo confort, sino por una mayor longevidad en estudio, brindando una mejor relación costo-beneficio de los materiales de elección. Sin embargo, uno debe saber bien sobre el acondicionamiento, la adhesión y la resina compuesta, incluidos el acabado y el pulido. El objetivo principal de esta investigación fue reportar un caso clínico de un paciente con pérdida de la dimensión vertical de la oclusión causada por hábitos parafuncionales. Durante el caso clínico descrito en el artículo, podemos analizar investigaciones que demuestran que la resina compuesta para casos posteriores es mejor, especialmente cuando hay múltiples casos de desgaste y parafunción, y también podemos analizar la técnica utilizada y la previsibilidad en el tratamiento, provocando mayor comodidad para el paciente y el Cirujano Dentista.
Palabras clave: Resina compuesta; Dimensión vertical de la oclusión; Restauraciones posteriores.

1. Introduction

Since the creation of the Gnathological Society, founded by McCollum in 1926, huge and endless academic discussions have been taking place on themes such as the Vertical Dimension of Occlusion (VDO), Maximum Habitual Intercuspation (MHI), Centric Relation (CR), Temporomandibular Joint Dysfunction (TMJ), parafunction, among several other definitions. There are several philosophical schools dedicated to this discussion, but the clinical possibilities presented by these concepts are even more numerous, what can lead to more questions than certainties. Those are old controversies in the area of dental prostheses; TMJ and occlusion and can be considered dogmas based more on beliefs than scientific facts in a debate dominated by "prophets" with beautiful speeches. However, without good scientific evidences, it is hard to make consistent clinical decisions (Barrote et al., 2019).

Generally, when there is loss or excessive wear of dental elements, the vertical dimension of occlusion needs to be reestablished before the permanent restoration procedure to avoid unsuccessful results that can lead to frustration for both the patient and the professional (Mukai et al., 2010, Hara et al., 2005; Mukai et al., 2009).

The main causes for the reduction of the Vertical Dimension of Occlusion have been discussed for years. This reduction can be a consequence of advanced erosive wear, which might lead to dentoalveolar compensation or increased free functional space (FFS) (Davies et al., 2002).

Life-style factors led to an increase in the risk of pathological dental wear among the general population and the prevalence of loss of the dental structure not linked to cavities, which has become a growing issue worldwide (Mukai et al., 2010; Kreulen et al., 2010).

Excessive attrition caused by parafunctions, such as centric and eccentric bruxism, and dental tightening can be considered a common challenge in current Dentistry, particularly because its etiology is hardly ever completely eliminated (Kreulen et al., 2010; Litonjua et al., 2003).

Beyond mechanical wear caused by parafunctional habits, the buccal environment can promote chemical erosion, i.e., caused by acids of intrinsic or extrinsic origin. Those of extrinsic origin are derived from diet (soda, citrus fruits, sport drinks, vinegar, wine, etc.), medication (acetylsalicylic acid, ascorbic acid, etc.) and occupational activities (inhalation of acid vapors, wine tasting, etc.). Gastric juice is considered an intrinsic source of acid because it reaches the oral cavity due to issues such as gastroesophageal reflux, frequent vomiting, anorexia nervosa, among others (Lussi & Carvalho et al., 2014).

Due to the mineral loss caused by erosion, the surface of dentin becomes a mesh of collagen fibers (organic matrix). Although this organic matrix is capable of slowing down erosion, it also hinders the penetration of the adhesive system bond (Hara et al., 2005). Hence, the collagen fibers not pervaded by the adhesive will be susceptible to hydrolysis, creating spots of water in the hybrid layer, favoring the uneven distribution of strength and interface flaws that can lead to the loss of adhesion with time. Brännström et al. (1976) show that the number and diameter of dentin tubules increase with depth, i. e., as it approaches the pulp. The dentin surface area is formed by 96% of intertubular dentin, 3% of peritubular dentin, and only 1% of

dentinal fluid. Closer to the pulp, the proportions are 66% of peritubular dentin, 12% of intertubular dentin and 22% of dentinal fluid (Giannini et al., 2010). Hence, the permeability of dentin is larger the closer it is to the pulp and differences in composition and morphology between surface and deep dentin affect the behavior and mechanical properties of dentin when submitted to chemical and physical agents during surgery and restoration procedures (Cunha et al., 2007; Swift Junior et al., 1995).

Direct and indirect restorations with resin are widely used in the restoration of posterior teeth (Veiga et al., 2016; Pallesen & Qvist et al., 2003). Traditionally, the choice between direct and indirect techniques for composite resins in posterior teeth is based on the size of the cavity to be restored. Small and medium cavities are usually restored with direct restoration of composite resin. Large cavities, where the width of the isthmus exceeds two thirds of the distance between buccal and lingual cusp ridges, are indicated for indirect restoration (Pallesen & Qvist et al., 2003; Huth et al., 2015). However, evidences show that composite resin restorations show adequate properties for use in posterior teeth, do not require invasive procedures and are completed in a single session, what complicates the clinical decision (Manhart et al., 2009; Frankenberger et al., 2014; Magne, 2000; Laegreid et al., 2014; Demarco et al., 2012). Therefore, to achieve durability, the treatment requires not only a good restoration material, but also a good technique (Veiga, et al., 2016). In this context, this paper presents a clinical case of a patient with loss of vertical dimension of occlusion due to dental tightening associated with acid diet. The case was approached using indirect adhesive restoration in composite resin.

2. Case Report

Patient L.M., male, age 24, arrived for his first appointment at the clinic of specialization in prosthesis of the IPPO Institute complaining of teeth sensitivity, headache, and joint deviation. An anamnesis was performed to assess the patient's health status and habits; clinical examination revealed enamel wear of posterior teeth, where dentin was apparent, thus causing dentin sensitivity. Posterior malocclusion and incisors strongly touching were also observed. After a thoughtful consideration of the case, we detected a parafunctional habit of dental tightening linked to excessively acid diet. We then proceeded to take the upper and lower molds and bite registration and mounted the case on the semi-adjustable articulator (SAA) in maximum intercuspation.

After the first appointment and mounting on SAA, we performed the diagnostic wax-up on the lower teeth to restore touching on bilateral posteriors, the molar guide and, as a result, increase the vertical dimension of occlusion.

After the proper registration, planning was transferred to the patient's mouth for the first inter-occlusal analysis using bis-acryl composite resin. We registered the touches with carbon and adjusted the contacts for the last assessment of the planning.

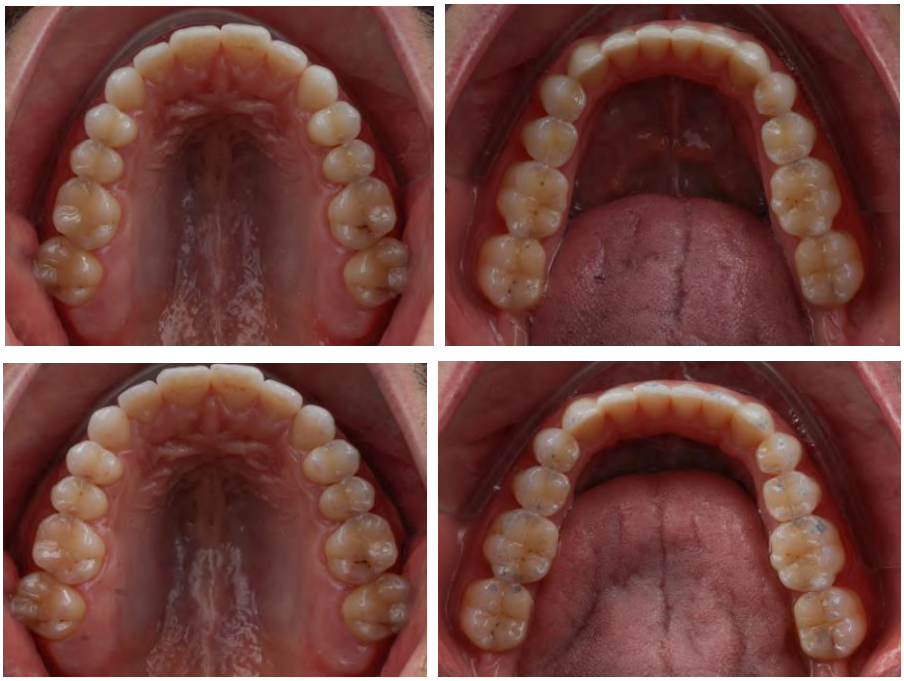
Following our assessment and reference studies, our choice was the composite resin for greater comfort of the patient, better photoactivation and polishing. Once the material was chosen, we started the manufacturing of the restoration using composite resin in the indirect way (Barrote et al., 2019).

To this end, the patient was molded using hydrogum 5 alginate; the mold was packed with type-3 dental stone and the mounting on SAA was performed following the same previous procedure. After that, super glue is applied followed by a thin layer of wax to insulate the plaster. This is an important step to create a relief and facilitate the removal of the restorations once finished. The restoration is then manufactured by using a thin layer of composite resin and following the technique of the Italian Style group of occlusal grooves, the Essential Lines. Lastly, an oxygen-blocker gel was applied to isolate the surface layer of composite resin before the first photoactivation session, which lasted 20 seconds on each face. The gel was removed and a second photoactivation session was performed.

For the cementation, we used absolute insulation according to the procedure in the tooth was cleaned using pumice stone with water and 50-micra aluminum oxide blasting. The tooth was conditioned in a selective way by applying phosphoric acid at 37% only on the enamel and the universal adhesive system on dentin and enamel (Clavijo et al., 2020).

The internal parts of the resins were also conditioned with 50-micra aluminum oxide blasting, phosphoric acid 37% and application of the adhesive system. Cementation was done with Variolink Esthetic LC cement from Ivoclar. After cementation, we performed the necessary occlusal adjustments, finishing and final polishing.

Figure 1 – Initial photos.



Source: Own Authorship.

Figura 2 – Mounting the models on the articulator.

Source: Own Authorship.

Figura 3 – Diagnostic wax-up.

Source: Own Authorship.

Figura 4 – Initial absolute isolation and cementation.

Source: Own Authorship.

Figura 5 – Final result.

Source: Own Authorship.

3. Discussion

Our research suggested that patients with wear caused by corrosion and parafunction should be managed with an adhesive restorative treatment with composite resin, whether direct or indirect, according to Damarco FF and Ono Y (Ono et al., 2010; Ilie et al., 2009).

However, special attention should be given to planning since the proper choice of material and restoration technique are decisive for the durability of the treatment (Veiga, et al., 2016).

Here, we have shown the importance of knowing the causes of wear that can be mechanical, caused by parafunctional habits, or chemical corrosion, caused by acids of extrinsic or intrinsic origin (Lussi & Csrvalho et al., 2014). This can lead to several issues; it can create an organic matrix that slows down the erosion process, but it can also hinder the penetration of the adhesive system bond (Hara et al., 2005).

Hence, for posterior teeth that do not need preparation, the material of choice is the composite resin, which is cost-effective, and allows working on thinner dentin with the possibility of adjustments, good predictability and durability when properly photoactivated and polished (Frankenberger et al., 2014; Magne, 2000; Laegreid et al., 2014; Demarco et al., 2012).

4. Final Considerations

We conclude that we should pay attention to parafunction and acid diets early on during patient management, particularly with young patients (Barbato & Peres et al., 2009; Lytle et al., 2001).

For patients with loss of vertical dimension of occlusion due to wear by corrosion and parafunction we must choose an adhesive restorative treatment with composite resin, whether direct or indirect, according to Damarco FF and Ono Y (Ono et al., 2010; Ilie et al., 2009).

The choice of composite resin in such cases is due to its cost-effectiveness, good durability and resistance. For posterior regions, where wear is already present and VDO should be increased without further wearing the resin, this is the material of choice (Veiga et al., 2016; Pallesen & Qvist et al., 2003; Laegreid et al., 2014; Demarco et al., 2012).

However, to reach this point, one must plan and study the case to avoid errors. Generally, where there is loss of dental elements or excessive wearing, the vertical dimension of occlusion must be restored before any definite restorative procedure (Mukai et al., 2009). The SAA mounting and wax-up are key steps for the expected result (Laegreid et al., 2014).

Hence, we conclude that for posterior restorations, the composite resin present relevant results in terms of clinical performance, not only in small cavities but also large ones. Such findings are consistent with those found in previous publications (Manhart et al., 2009; Hara et al., 2005).

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