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CASE REPORT

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Aesthetic and functional rehabilitation with Alumina: a case report

Reabilitação estética e funcional com Alumina: Relato de caso

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ABSTRACT

All-ceramic restoration of anterior teeth is a challenging clinical situation for which a variety of all-ceramic systems are available. The aim of this study is to present a case report of the construction of two single-unit metal-free fixed prostheses in anterior teeth. A 30-year-old male patient came to the Faculty of Dentistry, Federal University of Amazonas, concerned about his teeth. Elements 11 and 12 were endodontically retreated and fiberglass intracanal retainer posts were inserted. Dental crowns were prepared using the silhouette technique. The crowns were cemented with resin cement. The patient was very satisfied with his new smile and the aesthetic rehabilitation of the anterior teeth provided by the treatment.

KEYWORDS

Aesthetics; Oral rehabilitation; Dental porcelain.

RESUMO

A restauração totalmente cerâmica de dentes anteriores é um desafio na atual situação clínica onde há uma variedade de sistemas cerâmicos disponíveis. O objetivo deste estudo é apresentar um relato de caso com a confecção de duas próteses fixas unitárias metal-free em dentes anteriores. Paciente, 30 anos de idade, gênero masculino, estudante, apresentou-se à Faculdade de Odontologia da Universidade Federal do Amazonas, preocupado com a aparência dos dentes. O retratamento endodôntico dos elementos 11 e 12 foi realizado e, em seguida, foram colocados pinos de fibra de vidro. Os preparos dentários foram feitos usando a técnica da silhueta. As coroas foram cimentadas com cimento resinoso. O paciente ficou muito satisfeito com o seu novo sorriso, já que o tratamento proporcionou a reabilitação estética dos dentes anteriores.

PALAVRAS-CHAVE

Estética; Reabilitação bucal; Porcelana dentária.

BRIEF LITERATURE REVIEW

Dental ceramics are known for their excellence in artificially reproducing natural teeth. Since the introduction of metal-ceramic crowns, clinicians and researchers have been looking for a restorative system that can combine beauty, strength and durability without the presence of a metallic infrastructure. Indeed, dental ceramics are aesthetically the closest material to natural teeth. With the improvement of ceramic systems, it has been possible to combine the excellent aesthetic characteristics of this material with a considerable resistance to fracture [1].

Recent advances in all-ceramic restorative materials have made it possible to restore a patient to a high aesthetic level. There is also a growing demand for more routine provision of all-ceramic restorations. All-ceramic restorations are the most aesthetically pleasing restorations currently

available. In addition, new fabrication systems combined with computer-assisted fabrication systems (dental CAD/CAM) and various networks are now available [2-5].

The full coverage, all-ceramic restoration of an anterior tooth is a challenging clinical situation for which a variety of all-ceramic systems and cements are available. The decision-making process involves the consideration of a number of factors such as underlying substrate color, tooth preparation geometry, margin location and cementation system [6].

In-Ceram® (VITA In-Ceram® YZ-65/40, Vita Zahnfabrik, H. Rauter GmbH & Co, Bäd Sackingen, Germany) is a family of all-ceramic restorative materials that encompasses a range of strengths, translucencies, and fabrication methodologies designed to cover the wide scope of all-ceramic restorations, including veneers, inlays, onlays, and anterior/posterior crowns and bridges. In-Ceram alumina (alumina matrix) has a high strength and moderate translucency, and is used for anterior and posterior crowns [7].

The aim of this paper is present a case study involving the rehabilitation of two maxillary anterior teeth in a 30-year-old patient, using In-Ceram alumina by CAD/CAM system after endodontic retreatment, fiberglass post cementation and the reconstruction of core buildups.

CASE

A 30-year-old male patient came to the Faculty of Dentistry, Federal University of Amazonas, concerned about the appearance of his smile. The maxillary anterior teeth had extensive restorations with poor coloration (Figure 1). Upon examination, the patient was found to be in good general health and had a harmful habit of biting his nails. Clinical and radiographic exams identified extensive and unsatisfactory restorations in class IV composite resin in elements #11, #21 and #22, and a fracture of element #12. Element #21 had no pulp vitality and therefore did not respond to vitality testing, requiring endodontic treatment.

Figure 1 - Initial smile appearance.

The patient was warned about the need to perform surgical crown lengthening in order to match the height of the central incisors, but he refused the gingivectomy, claiming that he did not want to undergo a surgical procedure. The patient's wishes were respected and the procedure was not carried out, with no aesthetic impact, because the patient has a low smile that does not expose the cervical margin of his teeth.

After the patient's consent, treatment began with the endodontic retreatment of elements #11 and #12, filled using thermoplastic obturation.

The channels underwent desobturation, removing the gutta-percha from the canal, keeping 5.0 mm of gutta-percha in the apical area, and ensuring the sealing of the endodontic filling. The root canal was prepared with drills, adapting it to the format of the fiberglass intracanal retainer posts (White Post DC, FGM, Joynville, SC, Brazil), which were then placed in position. An x-ray was taken in order to evaluate the adaptation and positioning of the posts, and their surfaces were cleaned with 70% alcohol.

Next, 37% phosphoric acid gel (Magic Acid Gel, Vigodent/Coltene, Rio de Janeiro, RJ, Brazil) was applied to the root canal and remaining dental structure for 15 s. It was washed thoroughly and excess water was removed with absorbing paper cones, then silane (Prosil, FGM, Joynville, SC, Brazil) was applied to the surface of the post and left to dry. A Centrix syringe (Mark IIIp Tri-pack

starter kit, Centrix, Shelton, CT, USA) was used for applying the self-etch adhesive resin cement (RelyXTM U100 self-adhesive A2, 3M ESPE, St. Paul, MN, USA) to the root canal. After removal of the excess cement, front, incisal and palatal polymerization was performed.

After cementation of the posts, core buildups were constructed and the teeth were conditioned with 37% phosphoric acid for 15 s. They were then washed thoroughly, excess water was removed, and a layer of adhesive was applied (Adper™, Single Bond Plus Adhesive, 3M ESPE, St. Paul, MN, USA). The teeth were subsequently polymerized for 20 s. The incremental technique was used for the restorations, with composite resin (Filtek™ Z350 XT Universal Restorative A3.5, 3M ESPE, St. Paul, MN, USA) (Figure 2).

The dental crowns were prepared using the silhouette technique. First, a cervical marginal groove was made using a #1014 round diamond bur (F/G - 801-014, Microdont, Monsey, NY, USA). Orientation grooves were made on the frontal and incisal surfaces using a #3216 diamond bur (FG3216, KG Sorensen, Cotia, SP, Brazil), respecting the inclination of the cervical, middle and incisal thirds of the dental element. The guide grooves were then united. The cervical end was deepened by about 0.5 mm toward the gingival sulcus using a #3216 diamond burs, creating a beveled end. Finally, the preparation was refined with low coarseness diamond tips, leaving the walls smooth and corners rounded. A self-curing acrylic resin was used to make the temporary crown, which was cemented with chemically activated resin cement using calcium hydroxide (Dycal® Radiopaque calcium hydroxide composition, Dentsply Limited, Surrey, UK) (Figure 3).

Figure 2 - a) Temporary restorations with composite A3,5 resin Filtek Z 350 (3M ESPE), frontal view; b) Back view.

Figure 3 - a) Prepared dental crowns; b) Provisional dental crowns cemented.

Impressions were performed using addition silicone impression material (Express™ 2, 3M ESPE, St. Paul, MN, USA) and double molding technique. The technique of double molding to the gingival retraction was performed with #00 and #0 cords (Ultrapak® Plain Knitted, Ultradent Produtcs, South Jordan, UT, USA).

The porcelain color to be applied on the alumina copings (A3.5) was selected in advance, using a color scale (Vitapan® Classical, Vita Zahnfabrik, H. Rauter GmbH & Co, Bäd Sackingen, Germany) under natural light conditions.

The ceramic copings were made in the lab. The copings were tested on the preparation and returned to the laboratory for application of the veneering porcelain with the previously selected color (A3.5), according to the Vitapan® classical scale. In the next session, the crowns were cemented with resin cement RelyXTM U100 A2 (Figure 4).

Figure 4 - Alumina copings in the mouth.

In the next session, the In-Ceram alumina was cemented using CAD/CAM system, with RelyXTM U100 A2 resin cement, without pre-treatment of the dental element, meaning bonding and conditioning of the tooth structure were unnecessary according to the manufacturer's recommendations (Figures 5 and 6).

DISCUSSION

The recommendation of a root canal fiberglass post is directly related to the need to restore and endodontically treat teeth in order to help retain the restorative material and distribute the stress applied to the teeth [8]. As the teeth in this case were suffering from major coronal destruction, root canal posts were placed in order to reinforce the coronal portion, thus minimizing the probability of dental fractures.

The demand for metal free restorations in dental practice has increased, mainly due to strong aesthetic demand and concerns regarding metallic hypersensitivity. For veneers, intracoronal restorations, and complete-coverage restorations for single-rooted anterior teeth, clinicians may choose from any all-ceramic system on the basis of aesthetic needs. Reasonable

Figure 5 - In-Ceram alumina crowns made by CAD/CAM system on the plaster.

Figure 6 - In-Ceram alumina crowns cemented on #11 and #12 teeth.

evidence has shown the effectiveness of anterior three-unit fixed partial dentures made of lithium disilicate, alumina, and zirconia [9]. Alumina was chosen for the patient in this case because it is recommended for moderately translucent crowns [10], and its crowns fractured at loads that are suitable for clinical use in anterior crowns [11].

The literature demonstrates that multiple all-ceramic materials and systems are currently available for clinical use, and there is not a single universal material or system for all clinical situations. Successful application is dependent on the clinician matching the materials, the manufacturing techniques, and the cementation or bonding procedures to the individual clinical situation [12]. In this context, it is important to know about all of the ceramic systems currently available on the market, being aware not only of their main features, but also of their limitations, in order to offer a suitable solution to each specific clinical situation [13].

Alumina (VitaZahnfabrik) is an alumina-reinforced ceramic that has been used as a core material for crowns and anterior three-unit fixed partial dentures since the early 1990s [14]. It is the product of a homogeneous framework structure made of ultrafine Al2O3 particles, whose cavities are filled with a special glass. Its degree of tensile bending strength is significantly higher than that of all other ceramic systems [15]. A special glass is saturated, giving the restoration its characteristic color, translucency and high final strength [16,17]. Regarding its mechanical properties, researchers evaluated six commonly-used all-ceramic core materials using biaxial flexural strength and indentation fracture toughness tests. The biaxial flexural strength values of Cercon Zirconia, Zirconia and alumina core materials were significantly higher than that of other core materials [18].

In-Ceram alumina is recommended for anterior and posterior single crowns or anterior three-unit fixed prostheses when maximum translucency is required [19,20]. In-Ceram alumina (alumina matrix) has a high strength and moderate translucency and is used for anterior and posterior crowns [9]. In addition, the alumina cores had a uniform thickness of 0.6 mm with a thin edge at the crown margin to allow room for veneering ceramic all the way down to the margin, enabling the opaque, uniform color of the alumina to be covered [11].

The application of CAD□CAM technology in dentistry provides an innovative, state-of-the-art dental service to patients and is also beneficial for general practitioners. Conventional laboratory technology and dental technician skills remain important because dental restoration and prostheses are not just industrial products, but medical devices that need to function in the body. Therefore, new technology and conventional technology must be combined to meet patient demand [4].

This system was chosen because of the advantages it presents, such as more favorable aesthetics than metal-ceramic restorations, decreased thermal sensibility, higher flexural strength than dentin and enamel, biocompatibility, and a surface that prevents bacterial plaque [20]. In the clinical case presented, the In-Ceram Alumina by CAD/CAM system, allied with proper endodontic retreatment and the use of fiberglass posts and cores, is proven to be an excellent restorative option, allowing excellent aesthetic and functional results when clinical protocol and directions for use are followed.

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