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Full maxillary rehabilitation with an all-ceramic system

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Abstract

With the appearance of all-ceramic systems, providing a choice of framework porcelains and allowing the same material to be used for the veneer, it is now possible to select the ideal structure in terms of both function and esthetics. Silicate ceramics allow porcelain laminate veneers and crowns to be used in the anterior region, providing excellent esthetics; while for the posterior area, where function takes precedence, oxide ceramics, specifically zirconium oxide, are preferred. The IPS e.max ceramic system, heir apparent to the IPS Empress 2 system, combines the advantages of zirconium oxide ceramics (IPS e.max Zircad) with the excellent esthetic qualities of silicate ceramics (IPS e.max Press).

This paper presents a clinical case requiring complete maxillary rehabilitation for esthetic purposes. An overview of some of the porcelains used in this system, analyzed from both the clinical and laboratory perspective is provided. The esthetic advantages of a single ceramic veneer, the need to select appropriate ceramics for anterior and posterior regions, and cementation and surface treatments are discussed.

Key words: *Ceramic rehabilitation, ceramic restoration, ceramic bridges, IPS e.max, dental esthetics, porcelain.*

Introduction

We present a case report of esthetic rehabilitation, carried out on a patient whose main objective was to improve the oral condition, providing a maxillary fixed prosthesis to renew worn discolored teeth.

Case Report

Clinical history

The patient, 61 years of age and with no relevant medical history, wore a removable partial prosthesis substituting missing teeth 15, 12, 22 and 24 (Fig. 1). The

Fig. 1. Initial condition of the patient. Esthetic analysis.

Fig. 2. Definitive model of ceramic frameworks with individual abutments.

Fig. 3. Cemented restorations in the anterior group. IPS e.max Press bridges.

Fig. 4. Smile from the patient on completing treatment.

intraoral examination revealed a clear, right unilateral crossbite. In excursive movements an adequate right canine guide was absent, although this represented no problem to the patient. The crossbite originated from a unilateral discrepancy between the size of the larger mandible and the maxilla, which provoked a deviation from the midline. Clinical examination showed correct alignment of the gingival margins. However, the majority of teeth were in need of prior conservative treatment and endodontia due to the presence of numerous caries.

Diagnosis

Having understood the wishes of the patient and studied the clinical information, based upon the periodontal condition, a favorable gingival margin, the need to restore and protect various remaining teeth, and the possibility of improving the crossbite, a full maxillary restoration was considered the best therapeutic option.

Treatment plan

A series of objectives were defined before commencing treatment:

• To achieve a mutually protected occlusion, in spite of the posterior crossbite.

•To restore the excursive movements (lateral and anterior).

•To make no change in the vertical dimension, restoring only the worn incisal borders of the central incisors.

•To use a complete all-ceramic system allowing work on both the anterior and posterior region.

•To create esthetic, hygienic, ovoid pontics.

•To return the lost maxillary esthetics to the patient, advising on the impossibility of correcting themidline problem given the patient's refusal of orthodontic pretreatment.

Thus, the final posterior restoration consisted of a ceramic crown for tooth 17 and two porcelain bridges (16-15-14 and 24-25-26), using zirconium oxide-based ceramic for maximum strength. The anterior restoration consisted of two three-unit bridges (13-12-11, 21-22-23) using silicate ceramics to provide maximum esthetics (the underlined teeth are the abutment teeth) (Fig. 2). All the prostheses were fabricated using IPS e.max Ceram for the ceramic veneer.

Given the different composition of the cores, the restorations were cemented using two different techniques. The posterior bridges were silica coated using the CoJet System (3M ESPE®, St. Paul, Minn, USA), followed by silane application, then using Multilink self polymerizing cement (Ivoclar Vivadent®, Schann, Liechtenstein). The anterior group were prepared by hydrofluoric acid etching at 9.5%, silane was applied, then cementing with a composite resin, Variolink II base and transparent catalyzer (Ivoclar®) (Fig. 3 and 4).

Discussion

1. Esthetics

We believe it is a distinct advantage to have a single ceramic veneer as it provides esthetic harmony to a full restoration and simplifies the work in the laboratory. Regarding selection of the ceramic framework, the IPS e.max press was chosen for the anterior group for its translucent properties, always superior to any oxide ceramic (1,2). However, and giving precedence to strength over esthetics, the IPS e.max ZirCAD framework was selected for the posterior group. These have an opaque component; visible in areas of thin ceramic veneer and greater core thickness, such as areas close to the finish line of the palatal faces of the molars, although it is true that this can be mitigated by also forming rounded ceramic shoulders in these areas.

2. Fracture strength

Silicate ceramics present connector fracture rates of up to 30% (3,4), and should therefore be selected with caution, being used only in the anterior group and in the absence of parafunctional habits. Zirconium oxide-based ceramics are an alternative to the traditional metal ceramics for the posterior sector, as they can achieve fracture strengths of 800-1200 MPa. The manufacturer's recommendations should be fully respected with regard to connector thickness (5-7), the area in which the majority of fractures occur. We used 16 mm^2 connectors for the cores of the anterior group, and 9 mm^2 for the posterior group.

3. Cementation techniques

Ceramic restorations should be cemented according to their composition (8). In addition to obtaining maximum bonding strength, thus avoiding debonding in short abutments or problems with micro-filtrations, the fracture toughness of the restorations is also increased (2,9,10). Resin-based cement was used in both cases, presently considered the adhesive of choice for its high bonding values and esthetic characteristics (11,12). For the cementation of the disilicate ceramics, used in the anterior bridges, hydrofluoric acid etching followed by silane application has been shown to provide cement-ceramic bond strengths superior to those of the cementodentinal interface. Regarding posterior bridges, fabricated with a zirconium-oxide core, there are currently two tendencies towards treating the porcelain. The manufacturer recommends applying a primer on the surfaces to be bonded, with no sandblasting of the ceramic surface. This type of chemical treatment to the porcelain has been confirmed by diverse authors (13). On the other hand, and also based on many investigations (14), silica coating of the oxide ceramics provides an additional micromechanical bond, since the cement adheres very well to the silanated surfaces which improves the wettability of the porcelain.

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