TECHNOLOGICAL ASPECTS ON AESTHETIC REHABILITATION WITH FIXED PROTHESIS ON ZIRCONIA FRAMEWORK

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ABSTRACT

Aim of the study Over time, the aesthetic solutions for different types of restorations have become more complex requiring knowledge of the biodynamic and aesthetic principles of the materials and the characteristics of these materials in order to obtain a ceramic fixed prosthesis that is considered optimal from all points of view.

Material and methods The case report is represented by a 30-years old patient, who need an aesthetic rehabilitation of anterior dental arch by applying a ceramic fixed prosthesis with zirconia framework.

Results The Zirconium Framework construction stage was done with the aid of the CAD-CAM system. The CAD component virtually realizes the design of the future zirconium framework, and the CAM component physically realizes this framework structure based on the data previously provided. In order to achieve the aesthetic component of the structure so prepared, we are passing the application stages of the ceramic masses - VITA VM 13 ceramic masses.

Conclusions Particular properties of ceramic masses and zirconium, especially, - a varied Chroma, close to a vital tooth, brightness and translucency, will allow the development of aesthetic restorations and their guiding towards natural integration.

Key words: aesthetic rehabilitation, fixed prosthesis, zirconia framework

INTRODUCTION

Over time, the aesthetic solutions for different types of restorations have evolved, with more types of material on the market, and have become more complex, requiring a very good knowledge of the biodynamic and aesthetic principles of the materials and, above all, the characteristics of these materials in order to obtain a ceramic fixed prosthesis that is considered optimal from all points of view.

Oral rehabilitation using all-ceramic systems has become widespread all over the world because it is reliable and successful¹, considering its ability to simulate the optical properties of teeth in relation to color, surface texture, and translucency; low biofilm adherence;² wear resistance; and biocompatibility.³

The aesthetic aspect of a prosthetic restoration depends to a large extent on the metallic material on which it is applied, or zirconium. Zirconium ceramic crown is one of the most popular and advantageous solutions when it comes to dental restoration. Aesthetically and durably, it has many advantages over the inconveniences it offers.

Zirconia was introduced into dental technology in the 1990s and its appearance has attracted a wealth of advantages, from aesthetic to functional ones. Being a very durable material that imitates the natural appearance of the tooth, zirconia quickly gained ground.

The ceramic crown on zirconium support is obtained by a computerized milling process.
of a zirconium block (CAD-CAM), followed by the successive addition of ceramic layers. The result is very aesthetic due to the stability of zirconium during the addition process of the ceramic layers, which has a very high melting point.

In order to obtain better results in aesthetic rehabilitation using all-ceramic crowns, the design of dental restorations should be previously defined. Digital Smile Design (DSD) is a useful tool that allows a detailed analysis of the patient’s dental and facial characteristics through clinical, photographic, and diagnostic wax-up evaluations, enabling the identification of discrepancies in soft and hard tissue morphology.

MATERIAL AND METHODS

The case report is represented by a 30-years old patient, who need an aesthetic rehabilitation of anterior dental arch by applying a ceramic fixed prothesis with zirconia framework. The impressions (upper and lower) were registered in clinical stage, and the casts were made-up in the lab using Pindex method, and mounted into an articulator to transfer/keep all the registered relations from the mouth. (Fig. 1 and 2)

The Zirconium Framework construction stage was done with the aid of the CAD-CAM system. The CAD component virtually realizes the design of the future zirconium framework, and the CAM component physically realizes this framework structure based on the data previously provided. (Fig. 3 and 4)

In the next step there is a virtual realization of the zirconium framework at CAD-CAM, with the modelling the abutments to avoid retention areas, and then, by scanning the pattern with the antagonist, and then each abutment individually.

The modelling in the Exocad program is done by observing certain parameters related to the thickness of the heads (0.4 / 0.5), at the level of the package reaching even 0.3. In the proximal areas, soldering with a diameter of at least 1.5-2 mm is made. The boundaries of the package are drawn without exceeding the marginal limits. Making the elements is undersized to make enough space for the aesthetic element (2 mm).

In the Exocad program a diagnostic model of the future Wax-up type prosthesis can be made, which will be taken as an ideal model (with aesthetic component). (Fig. 5 and 6)

After completing the layout in the CAD component, the file is sent to the Rolland milling machine and the zirconium framework is produced in a rough, rusty and defective version, with the possibility of not adapting to the model.

The zirconium framework is machined with diamond discs and diamond cutters to produce a smooth, non-porous surface. The disc is mainly used on interproximal surfaces where it is difficult to penetrate with a spherical cutter, and it is also used to thin the package and produce rounded (mezial and distal) proximal angles.
RESULTS AND DISCUSSIONS

For the Zirconium frameworks the primer and opaquer application steps are missing, because zirconium has a color, similar to the natural tooth translucency. (Fig. 7)

In order to achieve the aesthetic component of the structure so prepared, we are passing the application stages of the ceramic masses - VITA VM 13 ceramic masses (Ivoclar).

From a morphological point of view, the lobes have to be prominent, to render the physiological aspect as close as possible to that of the natural teeth. Dentine mass is cut into oblique shape, at the incision edge with a sharp tool. Applying the dentin layer (with a higher degree of translucency) was performed in the incisal area and on the vestibular space at the maximum convexities, maintaining the space for the enamel coating. (Fig. 8)

The enamel layers are applied to the incision edge to obtain incisional transparency, and on the oral slope the transparent mass (Vita Glassklar).

The enamel mass deposition is carefully made so that there are no lines of demarcation between the two masses (dentine-enamel). The height of the teeth should be 1-1.5 mm longer than normal to balance the degree of contraction of the ceramic by burning. After applying the enamel mass, the surface must be smoothed with a soft, dry brush. After removing from the model, the dentine mass is applied to the proximal (mezial and distal) faces, obtaining a plus of 0.5-1 mm, necessary to restore the contact point. Then, it is necessary to check the margins for possible pots of ceramic mass. The prepared piece is placed on the sintering furnace for 10 minutes for drying, and then inserted with the holder into the oven chamber. The previously applied ceramic masses are burnt at 930°C with vacuum within 6-7 minutes in the Vita 200 furnace (Ivoclar-Vivadent).

After final processing, the glaze layer is applied to obtain a more natural look, also in accordance with the chromaticity of the patient's tissues. (Fig. 9 and 10)
In today’s generation, excellent aesthetics and biocompatibility of yttrium oxide zirconia based all-ceramic material meet all demands of an ideal prosthetic and restorative material. Yttrium stabilized zirconia has high flexural strength and fracture toughness.

Yttrium-oxide partially stabilized zirconia (Y-TZP) has adequate chemical and dimensional stability and its radio-opacity makes it easier to distinguish marginal integrity and caries.

The ceramic systems offer improved aesthetics, biocompatibility, and long-lasting restorations and are an excellent alternative for the rehabilitation of anterior teeth, having been increasingly used with high success rates.

The all-ceramic option allows dentists to create a more natural looking, because these ceramics have optical properties similar to the natural teeth.

All-ceramic constructions have a very good biocompatibility and do not induce inflammatory reactions.

The zirconium oxide used in dentistry is an extremely hard, with a stable structure due to the presence of yttrium oxide in the composition. Infrastructure is achieved by drilling zirconium, manually or computerized, which is subsequently sintered for mixing and hardening; after sintering zirconium skeleton had a resistance of about 850 MPa, similar to dental alloys.

Fixed prosthetic rehabilitation in the anterior area of the maxillary face with a natural appearance becomes a major challenge, given the presence of an inappropriate shape and the existing teeth size, irregular gingival contour and non-essential shade. In addition, the dentist and the dental laboratory technician have to work as a team to meet the patient's expectations, as aesthetics results are of major importance.
CONCLUSIONS
1. In constant competition with other materials, zirconium is gaining more and more ground due to its special aesthetic properties, being increasingly used for coronary restorations. Reflection of light on a zirconium coronary restoration is similar to that of the natural tooth.
2. The corrosion phenomenon at the level of the fixed prostheses, which can be betrayed by gingival reactions (the grey stripe around the edge of the metal-ceramic restoration), is absent, this being an advantage for the zirconium structure.
3. Prosthetic rehabilitation with zirconium support is lighter than metallic supports, so the adjustment/integration phase of restorations is faster.
4. To achieve a physiological aspect as close as possible to the natural appearance of the teeth, a modern approach is needed, so that specific shades are obtained by successive, layered applications in a precise and controlled manner.
5. Particular properties of ceramic masses and zirconium, especially, - a varied Chroma, close to a vital tooth, brightness and translucency, will allow the development of aesthetic restorations and their guiding towards natural integration.

REFERENCES