

Smile Rehabilitation Using Zirconia Based Fixed Prosthesis

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Published date: September 17, 2017

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Case Report

Abstract

In daily clinical practice, esthetics of anterior teeth is a common presenting complaint of patients. The esthetic of smile is related to multiple important factors : the color, shape, texture, dental alignment, gingival contour, and the relationship of these with the face. In this article, a 24-year old female consulted to replace her maxillary right central incisor #11 and left lateral incisor #22 missed after a road accident. A ceramic-based zirconia bridge was indicated.

Keywords: Esthetic; Smile; Ceramic, Zirconia; CAD/CAM Manufacturing

Introduction

Metal-ceramic restorations have been used for a long time, However, they have several disadvantages (light transmission is blocked by the metal, corrosion, cervical tattoo and allergic reactions in some cases). Therefore, authors focused their research towards full ceramic prostheses in order to have a natural mimicry [1-3]. That's why a variety of all ceramic restorations is now available, Currently, it is admitted that zirconia is an option worth

considering for restorations that need to be esthetically superior and serve patient well for years mainly when it is matched with the appropriate veneering ceramic (4-7). In this article, a 24-year old female consulted to replace her maxillary right central incisor #11 and left lateral incisor #22 missed after a road accident. A ceramic-based zirconia bridge was indicated.

Case Presentation

1. Extra-oral examination:

A healthy 24-year-old female patient consulted the fixed prosthodontic department to replace her maxillary right central incisor and left lateral incisor (#11 and #22) being missed since four years, after a road accident. A removable partial denture was placed as a waiting solution during socket healing, before a fixed treatment (Figure 1,2). The patient had a low smile line showing only teeth. She was looking for a prompt solution. The patient medical history was non-contributory.

2. Intra-oral examination:

The intra oral examination showed a good oral hygiene, moderate fluorosis without dental substance loss on anterior teeth. The edentulous ridge was high with reduced occlusal space. The central incisor #21 was inclined about 1.5 mm. The lateral incisor #12 was mesially tipped of 2 mm (Figure 3).



Figure 1: Initial view



Figure 2: View with a removable partial denture



Figure 3: Intra-oral view

3. Radiography:

Panoramic radiograph Showed no bone resorption. Abutments were well implanted with no peri-apical pathology (Figure 4). Peri-apical radiograph confirmed the good implantation of both abutment as well as correct crown-root axis (Figure 5).



Figure 4: Panoramic radiograph



Figure 5: Peri-apical radiograph

Treatment option

As the patient was demanding for a prompt solution, we performed an all ceramic prosthesis based on a zirconium infrastructure.

The diagnostic cast was waxed, a silicone key was performed to fabricate the provisional. Regarding to the preparation, the finish line had the shape of a deep chamfer. The preparations were made using a fine-grained diamond cutter and guided by the shape of the final restorations (Figure 6). The use of the silicone key helped to control the depth of preparation and respect the biological concepts. The 2 mm of occlusal surfaces were removed and 1.5 mm buccally. Then, corners and line angles were rounded.

The pulp was visible by transparency after preparation due to the important thickness of eliminated dental as the central and lateral were tipped and needed a correction of their axes. Thus, abutments were endodontically treated in order to prevent post-operative pain and long-term necrosis which could be complicated by infection. The key performed on the waxed model was used to fabricate the temporary bridge (Figure 7).



Figure 6: Teeth preparation



Figure 7: Provisional bridge

The temporary prosthesis was validated according to aesthetic criteria (shape, size, position and color of teeth), and functional criteria mainly the phonation (S, M, F, V). In addition, it must allow functional anterior guide. As this temporary prosthesis has been well accepted by the patient, it would serve as a prototype of the final one.

Before removing temporary prostheses, a maxillary impression was performed. The corresponding cast will be used by the laboratory technician, as a reference, while simulating occlusal path. Areas which are included in the dynamic occlusion were copied on the wax pattern.

Shade matching was made using a “3D Master shade”. After gingival deflection, the impression was made with a high and low viscosity silicone using double mixing technique (Figure 8). The impression of the mandibular arch was made with alginate. Both impressions were sent to the laboratory.



Figure 8: Master impression

After scanning the cast, zirconia framework was manufactured using indirect computer aided technology. The following step was to check the fitting of the framework regarding its insertion, marginal fit and retention (Figure 9). The dimensions of the connection areas were verified. Then, enough room for appropriate thickness of veneering material was checked. After veneering, the ceramic was tried, intra-orally, to assess the esthetic outcome in terms of color and shape of the bridge.

Contact surfaces and their intensity were checked in favor of creating prosthetic embrasures which should allow a correct practice of hygiene habits. The functional criteria were validated; to note the phonemes (S, M, F, V). Occlusal area were adjusted to allow a functional anterior guide. The bridge was cemented using a resin-based glass ionomer.



Figure 9: Zirconia frame work fitting



Figure 10: Final view

Discussion

All-ceramic crowns have been used over the last four decades as an alternative for porcelain-fused-to-metal crowns to overcome their esthetic limitations. They can be made from different types of ceramics, which have different physical and esthetic properties.

Currently, zirconia based restoration is considered as a suitable treatment option for patients seeking for high esthetic outcome. Moreover, zirconia is achieved using CAM procedure which is characterized by its accuracy and precise technical characteristics [8-11].

In this case, the temporary bridge has many advantages such as restoring esthetics, protecting the abutment and acting as a healing guide after the plastic surgery which aimed to create enough room responding to an appropriate height of prostheses. Margins were, thus, performed in favor of a harmonious gingival architecture of the edentulous ridge, to be, finally, aligned with adjacent teeth.

That's why visits were phased out weekly, and in each appointment, esthetic and functional criteria were checked. The temporary bridge was modeled in favor of esthetic and functional outcome, it must be polished before bonding.

Before removing temporary prostheses, a maxillary impression was performed. The corresponding cast will be used by the laboratory technician, in order to achieve a functional anterior guide. In addition, it will be useful as an esthetic guide (shape, size and teeth orientation) [12].

Dentists primarily made a systematic decision to treat the teeth endodontically before prosthetic rehabilitation. Whereas, currently, the decision is based on evaluation of the pulp health and peri-apical X-ray.

Tooth reduction has to be done regarding the appropriate thickness of the restoration, but, if the pulp volume is important this will endanger its health. So, endodontic treatment become necessary [13,14]. Coming to the use of zirconia, within the last few years as a bridge infrastructure, this is explained by its non-metallic color, fracture resistance with flexural tests over 1,000 MPa, and excellent long-term clinical success [15,16].

Likewise, conservative zirconia-fixed partial dentures can be a minimally invasive alternative for anterior tooth replacement and have proven to be very successful; particularly if retentive preparations are done.

In addition, researchers proved that 20 year life of the material is possibly predicted based on a study of subcritical crack. The general fit of the restorations is acceptable, with a marginal gap in the range of 30 μm to 50 μm [17-19].

The initial strength, and survival rate, of a dental Y-TZP ceramic material to fatigue testing was found to be highly dependent upon surface preparation more than exposure to various hydrothermal exposure conditions [20, 21].

Thus, it is necessary to adjust occlusion before glazing not to compromise the surface roughness of ceramic. Despite minimal chemical adhesion with zirconia using traditional bonding systems, micromechanical retention has been sufficient for complete coverage restoration [22-24].

Conclusion

Zirconia frameworks offer new perspectives in metal free fixed partial dentures and single tooth reconstructions because of zirconium's high flexural strength of more than 900 MPa and showed good first clinical results. Currently, zirconia based restorations provide esthetic restorations responding to patients' demand.



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