

CASE REPORT

Zirconia-based Fixed Partial Dentures in the Maxillary Anterior Region

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ABSTRACT

The absence of anterior maxillary teeth, as a result of congenital anomalies, or their loss due to extensive carious lesions or a trauma may lead to serious esthetic and functional problems. Therefore, the anterior esthetic and functional rehabilitation is a common practice in fixed prosthodontics. Even though handling it successfully is still a challenge for the practitioner, in such cases, performing fixed partial dentures (FPDs) is the most common procedure to replace lost teeth. The choice we are offered is either metal ceramic FPD, which is the gold standard in fixed restorations, or zirconia-based FPD. Nowadays, the choice is to combine longevity to desirable esthetic result. Several parameters should be studied to decide one of the two options. In this study, a 55-year-old male patient consulted to replace teeth #11 and #12. A zirconia-based FPD was indicated.

Keywords: All ceramic fixed partial denture, Anterior fixed partial denture, Esthetics, Zirconia.

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INTRODUCTION

In spite of the increase in the use of all-ceramic FPDs, metal-ceramic systems continue to be used, thanks to their clinical longevity and biocompatibility. This kind of prosthesis is used mainly when a large number of teeth should be replaced. The advantages of metal-ceramic FPDs lie on their predictable structural performance, versatility, and cost.¹ However, metal-ceramic FPDs cannot be the number one solution to solve esthetic problems in maxillary region. The metal gray shadow effect showing through thin gums cannot be avoided with these FPDs. It is also difficult to have real resemblance with natural teeth surfaces. Biologically, the use of metal framework

can trigger an allergy or intolerance within the patient added to eventual galvanic reactions and corrosion.²

Zirconia has been used since 1960. From the start, its promising *in vitro* properties attracted the attention of dental researchers, and in the last decade it has acquired increasing prominence. The properties that are in favor of its use in dentistry are biocompatibility, low thermal conductivity, resistance to corrosion, and high tenacity, due to its totally crystalline microstructure.³

Studies showed that zirconia-based FPDs are made with highly polished surfaces so they prevent the plaque buildup (confirmed with the scanning electron microscopy analysis).⁴

CASE REPORT

A 55-year-old male patient was referred to our department. His chief complaint concerned teeth #11 and #12. Both teeth were root treated and restored with amalgam restorations. The two incisors were also severely discolored and extruded with a degree 2 mobility (Figs 1 and 2). The teeth extraction was indicated. After that, an immediate partial removable denture was placed.

Three months later, when the bone healing was obtained, a six-unit zirconia-based FPD was indicated to replace the extracted teeth and to correct the anterior teeth tipping and extrusion.

As known, the indication of a ceramic FPD should not be hazardous. Before indicating a ceramic system for anterior FPDs, a good case study must be established, considering the whole clinical context.



Fig. 1: Preoperative view

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Fig. 2: Periapical radiograph of teeth #11 and #12

In this case report, the intraoral examination showed a favorable occlusion. The edentulous ridge seemed to be satisfactory. We also examined the coronal height of teeth to be supporting the FPD, which was judged as favorable.

After decision-making, teeth preparations were made. For that, several steps should be respected:

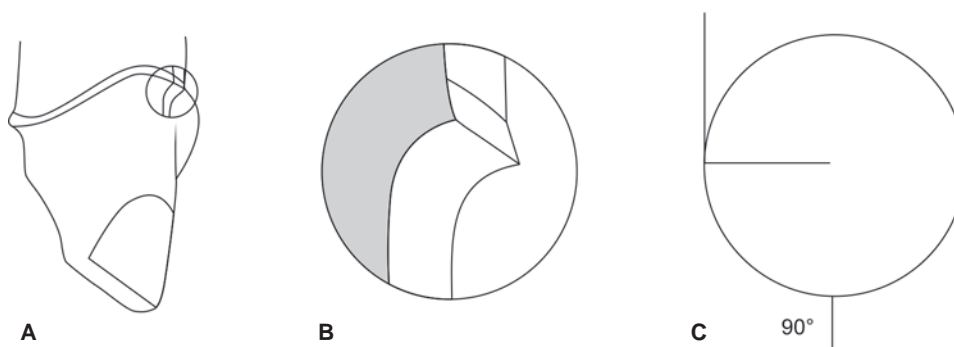
- A deep rounded chamfer bur was used to make a wide finish line allowing the reduction of stress by more than 50% at the ceramic. Cervical margins of

the preparation should be smooth and uniform for a better precision, while scanning the model, and a well-fitting of the zirconia core (Fig. 3). This also prevents ceramic chipping and cracking in the margin area.

- Axial walls required a taper of 7 to 10° (and it can go up to 15°). All the tooth preparation edges should be rounded, with no sharp angles, to prevent internal stresses in the crown.
- Reduction values:
 - Incisal edge: axial reduction of 2 mm,
 - Proximal surfaces: 6 to 8/10th of a mm,
 - Labial surface: 12 to 15/10th mm matching to 8/10th to 1 mm cosmetic ceramic + 4 to 5/10th for the framework,
 - Palatal surface: 8/10th to 1 mm (Fig. 4).
- In the final step, the preparation is finished to smoother surface with medium diamond grit⁵ (Fig. 5).

After that, the chair-side temporary prosthesis was fabricated. Master impression was made (Fig. 6) using a commercial tray with high and light viscosity silicone. The master cast was scanned for the computer-assisted design of the zirconia framework.

There is no single base shade to provide an adequate shade match. Different shades are needed in the gingival,



Figs 3A to C: Deep chamfer finish line

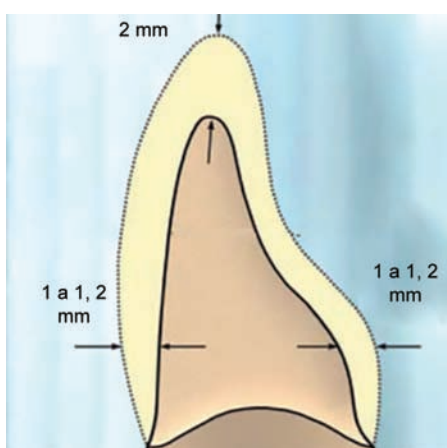


Fig. 4: Reduction values



Fig. 5: Intraoral view of teeth abutments after preparation

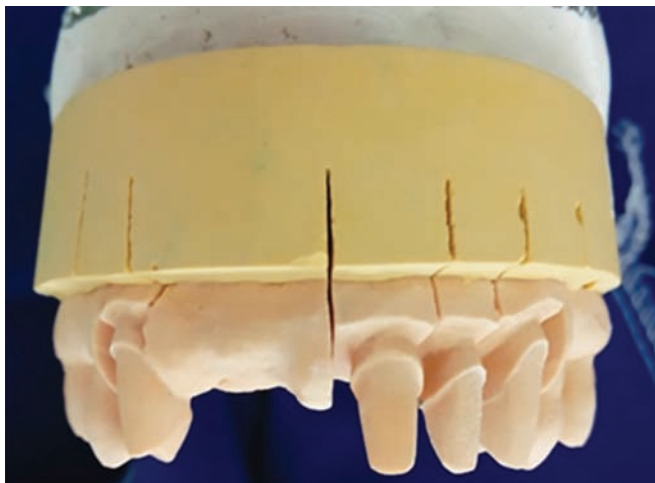


Fig. 6: Master cast



Fig. 8: Definitive six-unit zirconia-based FPD

body, and incisal third of the tooth. VITA 3D master shade guide was used for the shade mapping. The reference was then communicated to the laboratory technician.

When zirconia framework was delivered from the laboratory, several try-ins were performed. We started with the zirconia-core try-in (Fig. 7) to verify the margin limits fitting, insertion, and retention.⁶

The connectors' height was also checked during this step. When this step was checked, we moved to the second try-in after cosmetic ceramic was carried out. This allows the verification of teeth morphology, color, embrasures, and occlusion. Then, staining and glazing were made before the definitive cementation⁷ (Fig. 8).

DISCUSSION

When the patient first consulted for teeth replacement, the first treating option we could think of was implant-supported crowns. It seems to be the best option for the case offering good esthetic results without mutilation of residual teeth. But the intraoral examination showed an extrusion in tooth #21 with a slight deviation of the midline. A gingival recession was also clearly revealed in all anterior teeth. Thus, the wise choice was to remake the whole patient's smile, while replacing the missing teeth using a FPD.



Figs 7A and B: Intraoral view of zirconia framework try-in

Intraoral examination showed a favorable occlusion, which is necessary for the ceramic FPD integration. The edentulous span seemed to be satisfactory, allowing to place two pontics replacing both lateral and central right incisors, without exceeding 12 mm in mesiodistal measurement. We also examined the coronal height of teeth to be supporting the FPD, which was judged as favorable to achieve the required connectors' dimensions for zirconia-based FPD.

Open embrasures for facilitating plaque control and oral hygiene and for maintaining healthy papillae are mandatory. If the patient has a reduced interocclusal distance, it may be difficult to achieve the required connector dimensions without compromising these biologic demands. Caution is advisable if the patient is a heavy bruxer and the parafunctional activity cannot be controlled.⁸

Clinical studies have revealed a high rate of fracture for porcelain-veneered zirconia-based restorations that varies between 6 and 15% over a 3- to 5-year period. These are high values compared with the 4% fracture rate shown by conventional metal-ceramic restorations over 10 years. The cause of these fractures is unknown but might be associated with bond failure between the porcelain-veneered and the zirconia structure.⁹

CONCLUSION

The zirconia-based FPD is a suitable solution to replace anterior teeth, restore esthetics, and respect biological and

mechanical context of the restoration.¹⁰ The long-term success of this restoration depends not only on the final esthetic result but also in respect of the clinical steps all along.

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