Resin-Bonded Fixed Partial Dentures: from Metal-Ceramic to Zirconia What Concerns?

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ABSTRACT
This article describes the use of a resin-bonded fixed partial denture as a conservative solution for the replacement of a missing lateral incisor. A etal-ceramic resin-bonded fixed partial denture RBFPD had been firstly performed then it was replaced by a ZRB-FPD for biological and esthetic concerns.
Key words: Resin-bonded fixed partial denture- Zirconia – Framework – minimally invasive approach

INTRODUCTION

Patients having one anterior missing tooth have different treatment possibilities, which involve removable partial dentures, conventional full coverage retainers, fixed partial dentures (FPDs), and implants[1,2]. The current tendencies in treatment must be an economic option with predictable aesthetic and functional results for the patient [3].

So, among these options, fixed partial dentures, which allow clinically sufficient aesthetic and functional outcomes with minimal surgical intervention, have been widely used in clinical cases[4].

The advantages of RBFPD are basically their non-invasive approach to dentin with only lingual and proximal tooth preparation, then tissue tolerance because of supragingival margins, and finally it reduces both the time and the cost[5; 6].

Nowadays, all authors are convinced that RBFPD are definitely accepted in clinical practice with the concept of minimal intervention (because they preserve the adjacent teeth fairly intact and keep the natural texture of buccal faces).Various studies on this issue have been done and published,and their usefulness is widely clear [7] proving that RBFPDs have shown successful results after a 10-year follow-up period. In addition, a retrospective 13-year follow-up study performed by Zalkind *et al* showed that RBFPDs may serve as long-term or semi-definitive restorations [5].

Whereas, RBFPDs present many disadvantages such as the gray color of the incisal third of the abutment teeth owing to the cast metal lingual retainers., this aesthetic weakness takes place from bonding a metal to the lingual surface of the abutment teeth, and therefore its natural translucency disappears[4, 8].

In our daily practice, patients who have growing interests in aesthetics together with metal allergies drawbacks have paved the way to the use of metal-free restorations in fixed prosthodontics [4; 9].

Indeed, all-ceramic crowns using zirconia have spread rapidly, and zirconia has been widely used in frameworks of crowns and FPDs due to its unique mechanical properties, including so-called "transformation toughening" [4, 5].

Therefore, RBFPDs using zirconia are assumed to improve the rigidity of all ceramic RBFPDs and allow them to reduce the distortion under functional loads. In other words, a zirconia framework currently has the potential to reduce the amount of tooth reduction required to secure its rigidity, compared to a metal framework designed according to the traditional standard. The fact of reducing the amount of tooth preparation is considered to have high clinical significance for the application of ZRBFPDs [4, 15].

The clinical report below describes an alternative treatment for the replacement of a lateral incisor using firstly a metal-ceramic RBFPD which was then replaced by a zirconium resin-bonded fixed partial denture (ZRBFPD).

CASE REPORT:

A 30-year-old female with a noncontributory medical history presented to the Fixed Prosthetics Department of the Dentistry Clinic, University of Monastir for the replacement of the upper lateral left incisor. Further examinations proved that the abutment teeth were intact, immobile, had a favorable crown to

root ratio (radiographic crown height / radiographic root height <1) confirmed by the panoramic and periapical radiographs.

The central abutment was slightly tipped presenting a longer incisal edge compared to its adjacent central, with asymmetrical margins (Fig. 1).

Figure 1: Preoperative frontal view.

An Implant-supported crown, a RBFPD, or a conventional FPD, were the treatment options presented to the patient for the replacement of her missing tooth. On one hand, conventional FPD was not the most suitable solution for the patient and it was also excluded because the abutment teeth were vital and intact [5, 14].

On the other hand, the patient preferred the RBFPD rather than an implant-supported prosthesis because no surgical procedure was needed and the RBFPD requires easier steps.

However, the cantilever RBFPD is frequently indicated, our choice focused on two retainers, to increase the area of the preparation and thus the bonding performance.

The first stage of the preparation was marking occlusal contacts and defining the limits using a round diamond bur with a cervical limit at 1mm of the margin, within the enamel which had to be preserved for bonding. In fact, it is commonly advised that the circumference of the preparation is completely in enamel to ensure a better sealing of the prosthesis which enhances the bonded bridge longevity. The lingual surfaces of the abutment teeth were reduced approximately 0.5 mm. The finish line continued in proximal, while remaining on the side point of the distal contact. The prepared area consists the future bonding zone. The occlusal limit of the preparation depends on the situation of the edge of the opposite teeth and it must be far from (2mm) the contact surface between teeth. Moreover, it must not interfere with the tooth edge presenting a high transparency. [8, 10, 11] The lingual and proximal walls of the central were prepared with a combination of opposing vertical grooves placed at line angles for mechanical retention [12].

Two little cavities has been performed using around diamond, in the cingulum of the central and canine to increase the bonding surface and the prosthesis stability and retention [8].

A Gingivectomy was performed in order to improve the level of the gingival collars, followed by a slight grinding of the edge of the central abutment (fig 2).

Figure 2: Marking preparation area on the cast

In fact, the patient had been satisfied with the metal-ceramic RBFPD (fig 3, 4) during 5 years, requested its replacement by an all ceramic RBFPD.

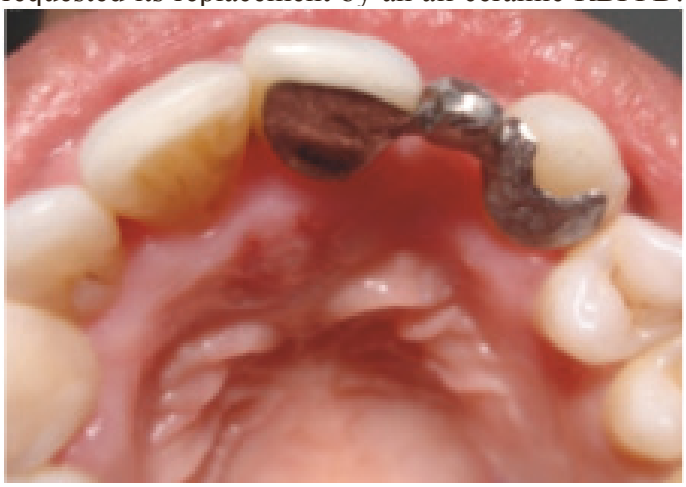

Figure 3: First trial of the metallic framework.

Figure 4:View of the bonded ceramo-metalic RBFPD

Being encouraged by the patient's motivation, we decided to replace the bridge by a similar non-invasive option allowing a more biocompatible that was RBFPDs using zirconia.

We started by debonding the first bridge. Thus, necessary corrections of the preparation were made to ensure the longevity of the full ceramic prosthesis. Besides, preparations limits were redrawn with a bur to be more readable by the laboratory technician. Whereas more room was necessary in proximal faces, allowing connectors with sufficient mechanical behavior, with due care so that the preparation limits are not buccaly visible. The preparation was carefully polished to avoid any risk of ceramic fracture (fig 5).

Figure 5: the preparation slightly modified

The framework was designed by computer manufactured high-strength Zirconia (Y-TZP) (Cerec in lab system) (fig 6).

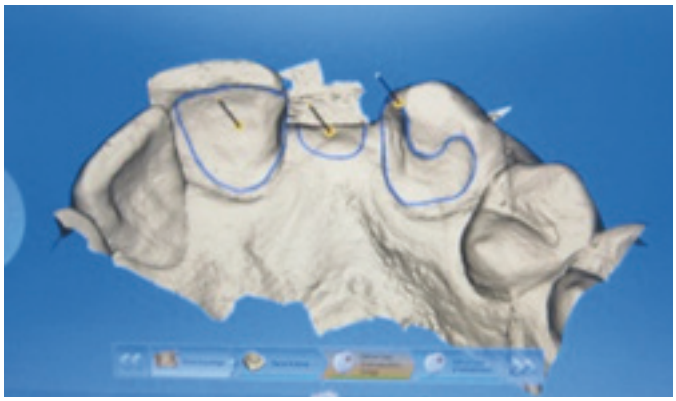

figure 6: computerized manufacturing of the framework

Then VM9 ceramic was used for veneering to ensure the best aesthetic outcome.(fig7) .

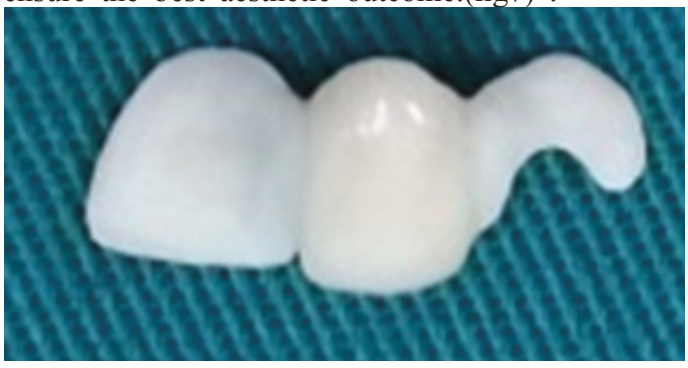

FIGURE 7: FRAMEWORK AFTER VENEERING

Finally, a big care was given for the bonding procedure, which could affect the prognosis (fig 8, 9).

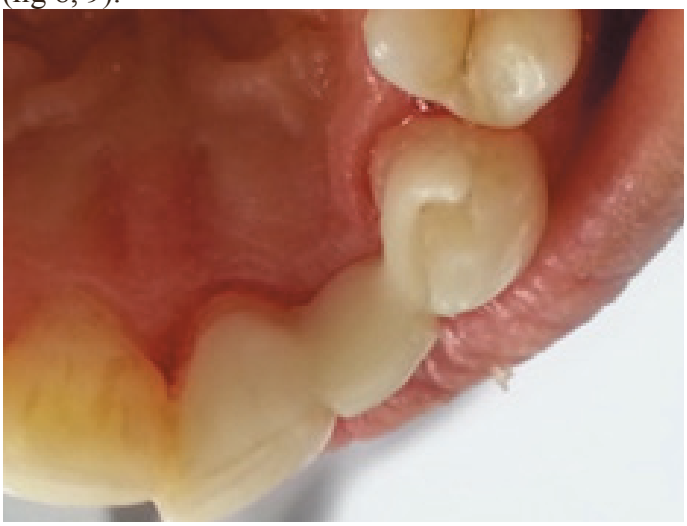

Figure 8: palatal view of the bonded ZBFPD

Figure 9: Frontal view of definitive restoration.

DISCUSSION

This case illustrates the transition from metal–ceramic RBFPD to all-ceramic RBFPD.

The Indication of this option is justified by the aesthetic demands of the patient.

The choice of two retainers was justified by the increase to the bonding surface and based on some studies which revealed a significantly higher fracture resistance for two-retainer RBFPDs than for cantilever RBFPDs [13].

Current advancements involve the inclusion of all-ceramic systems to eliminate the metal framework and reduce the disadvantage of unaesthetic appearance due to metal inclusion in the incisal third and proximal areas of the abutment teeth. [9, 14].

The use of a zirconia based ceramic (Y-TZP) was proved for its excellent mechanical properties as compared to another type of ceramic. The CAD/CAM (computer aided design and manufacturing) was performed to ensure maximum stiffness and precision of the framework.

The connection of the all ceramic framework known as the weakness zone as exposed to fracture was particularly increased compared to that of a metal framework.

Finally, due care must be taken to check the interocclusal relationship, anterior guidance and potential points of interference in lateral movements before fabrication of a RBFPD, to minimize eventual risk of debonding or failure of the restoration.[5]

SUMMARY

This clinical report describes abutment tooth preparation, and clinical procedures involved in the fabrication of a metal-ceramic RBFPD then a zirconia RBFPD, which provides a conservative solution for the replacement of upper lateral incisors.

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