

Restoring One Maxillary Fractured Incisor with a Porcelain Veneer: A Case Report

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Abstract:- Nowadays, facial appearance takes an important place in social life especially when it comes to the smile. In fact having even one unaesthetic tooth will negatively affect the social integration and self-esteem of the person particularly among young people. So the ultimate challenge for the dentist is to restore the patient's smile with the most conservative and aesthetic way. Within the philosophy of less is more and respecting the therapeutic gradient the indication of minimally invasive restoration took a place. Dental porcelain veneer present a suitable option for aesthetic restoration since their introduction in 1983 and this is based on their strength, longevity, conservative preparation, aesthetics, and biocompatibility. The clinical success that the technique can be attributed to many reasons such as the conservative preparation of the teeth; proper selection of ceramics to use; proper selection of the materials and methods of cementation; and proper planning and communication with the ceramist. In this article we will illustrate step by step the restoration of one fractured maxillary incisor with a feldspathic veneer.

Keywords: Central Incisor; Veneer; Bonding; Esthetic; Dentistry.

I. INTRODUCTION

Dental trauma is a common reason for tissue loss and it frequently involves the anterior region (1). Rehabilitation options for fractured incisors depends on the injuries characteristics (2).

When it occurs in the aesthetic area it may represent a challenge. The dental changes resulting from this clinical occurrence lead to a reduced quality of life of patients because it affects their self-esteem (3), (4). The aesthetic factor is even more critical considering the standards of beauty socially imposed, where minimal changes in shape, color and/or positioning have become highly valued.

When choosing the type of treatment, some clinical aspects are key to be considered, like the age of the patient, the quality of the remaining tooth structure, the location of the fracture line, and the presence of occlusion dysfunction. (5), (6).

Although composite resins can be used in certain clinical cases, all-ceramic restorations offer superior esthetic outcomes and durability. Direct restorative materials have limitations in terms of maintaining shine, shade, and longevity, whereas all-ceramic restorations are better equipped to preserve these qualities over time (7). Etching the ceramic surface has been shown to enhance the long-term bonding effectiveness of composite materials and tooth tissues, making all-ceramic restorations a viable treatment option (8). Furthermore, by utilizing partial preparations such as veneers, all-ceramic restorations can help maintain dental integrity by reducing the amount of tooth structure removed (9). In addition, ceramics are often mentioned as the material of choice in terms of fracture resistance and color stability (10).

II. CASE DESCRIPTION

A 28-year-old female patient attended at the department of fixed prosthodontics of the dental clinic of Monastir. She was complaining about the unesthetic appearance of her maxillary central incisor.

A clinical examination was conducted. It revealed overlapped central maxillary incisors. The tooth #11 was rotated medially, with a composite restoration poorly bonded on the incisal edge. Her Oral hygiene was satisfactory (Figure 1).



Fig 1 Intra-oral frontal view

An orthodontic treatment followed by prosthodontic intervention was suggested to the patient but she rejected that option. The minimally invasive ceramic veneers on tooth #11 was selected.

Study impressions were first performed and casted. A diagnostic wax up was made to prefigure the final result of our esthetic project. (figure 2)



Fig 2 Diagnostic Wax-Up

The wax-up was necessary to make modifications in central teeth arrangement and obtain the patient’s consent to the treatment plan. A silicon matrix was then performed to make the intraoral mock up (figure 3).



Fig 3 Smile View of the Aesthetic Mock Up



Fig 4 Intra-Oral View of the Prepared Tooth

When the diagnostic mock-up was placed in mouth the smile line, occlusion, phonetics, and esthetics were evaluated.

Shade selection was performed and photographs were taken with and without shade tabs at various angles.

The preparation was made over the mock up (figure 4).

A rounded diamond bur was used to mark three depth grooves through the mock-up, taking into account that the minimal thickness of the veneer was 0.3 – 0.5 mm.



Fig 5 Full Arch Impression

A Cervical groove is created to initiate a sketch of the future cervical finish line. A right angle (butt-joint) preparation with incisal overlap of 1 to 1.5mm was achieved to manage enough space providing edge translucency. Proximal contact areas were not included to the tooth preparation. Chamfer finish line was maintained in the cervical region at the level of the gingival margin. All internal angles were smoothed to reduce stress concentration.

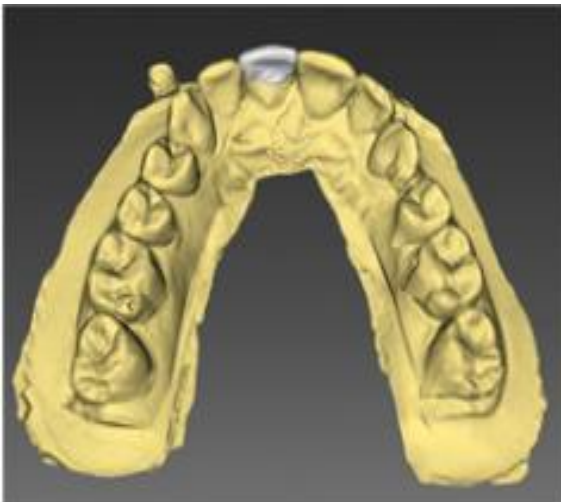


Fig 6 Computer Aided Design of the Ceramic Veneer

Maxillary and full-arch impressions were made using polyvinyl siloxane material (Zetaplus Zhermack) (figure 5).

The die shade was evaluated using IPS natural die Material (Ivoclar Vivadent). The bite registration and photographs were also sent to the ceramist with a complete laboratory prescription detailing the required outcome and patient desires.

The veneer was fabricated with a high-translucency Lithium Disilicate reinforced glass ceramic (IPS e-max; Ivoclar Vivadent AG) using CAD/CAM technique (Figure 6).



Fig 7 (a) Tooth Surface Etching



Fig 7 (b) Application of the Bonding Agent

Layering ceramic (IPS e-max ceram; Ivoclar Vivadent AG) was used to guarantee a lifelike play of light and improve its appearance.



Fig 8 (a) Final Result, Buccal View



Fig 8 (b) Final Result, Lateral View

The prepared tooth was cleaned and the veneer was tried-in using a transparent try-in paste (Variolink Veneer try-in paste, Ivoclar).

The form, adaptation and shade match of the restoration were checked and the ceramic veneer was

adhesively luted in accordance with the guidelines of the manufacturer of the composite resin (Figure 7).

The patient was provided strict oral hygiene instructions and regular examination appointments. (Figure 8)

III. DISCUSSION

Maxillary incisor fracture, especially occurring at a young age, can cause psychosocial discomfort in addition to esthetic impairment. (1), (9).

This case report showed a restoring sequence of a maxillary central incisor fractured and rotated using ceramic veneer.

Orthodontic management followed by prosthetic treatment would have been the ideal line of treatment for this case. However, orthodontic treatment was rejected by the patient.

The conservative option with ceramic veneer seems a reliable and successful alternative in such case, with a survival rate of 93.3% after 15 years (10).

Nevertheless, appropriate treatment planning is needed for such cases. Creating a proper diagnostic wax-up is crucial for diagnosing and treating fractured teeth with veneer restorations (11).

It offers valuable information related to the size discrepancies between healthy and fractured teeth, available restorative space, occlusal scheme, and other required treatments in the opposing arch (12). The diagnostic wax-up can be transferred to the patient's mouth as a mock-up to allow them to evaluate the proposed restorations both visually and tactilely.

Additionally, the diagnostic wax-up can serve as a treatment tool by providing diagnostic and preparation guides. The diagnostic guide helps the clinician to determine the thickness of the future restoration required to replace the fractured tooth segment, while the reduction guide can assist in reducing the extension of tooth preparation if necessary. In both cases, reduction guides were used for planning and executing the final restorations.

The diagnostic wax-up was essential to provide a mock-up for patients and clinicians to evaluate the proposed restorations visually and tactilely, and the guides, which were fabricated from the diagnostic wax-up, aided in evaluating the facial space required for the final restorations (13).

As for the preparation, a cervical chamfer design might be a better choice for porcelain veneers because it has a lower maximum principle stress, a more uniform stress distribution in the cement layer, and a high clinical success rate. The palatal chamfer design for porcelain

lamine veneers tolerates stress distribution better than the butt-joint design (14).

With advancements in laboratory techniques and dental materials, it is now possible to produce ultrathin feldspathic veneers with thicknesses as small as 0.1-0.5 mm, which can be bonded to tooth structure with minimal or no preparation required, restoring fractured teeth (15).

Conservative tooth preparation with ceramic veneers can help prevent excessive removal of tooth structure and provide a second opportunity to the tooth in case a secondary restoration, such as a full coverage crown, is needed in the future. It is important to note that restorations are not permanent, and therefore, conservative approaches like ceramic veneers can help preserve the natural tooth structure.

The choice of material for single-tooth porcelain veneer seems to be case-specific. It is influenced by several factors such as the die shade, the opacity of natural teeth and cost and benefit analysis. Therefore, a thorough knowledge of the different materials available for this purpose, and their applications as limitations will enable the dentist to select the best option available for each patient's needs (16).

Milled veneers can satisfy esthetic requirements of recovering normal color abutment teeth. The thickness, shade, and type of ceramic materials become important variables in manipulating the final color of ceramic laminate veneers because the target color of veneer restorations and abutment shades cannot always be chosen by clinicians. In practice, the thickness of a veneer restoration is restricted by the minimal amount of tooth preparation and target restorative space. In addition, the different resin cement shades might be selected to slightly modify the final color of ceramic laminate veneer. Therefore, clinicians must consider which kind of CAD-CAM material can better recover the optical properties of natural teeth to achieve a good color match. The abutment tooth color is the primary source of the final esthetic outcome of ceramic veneers (17).

Ever since the inception of glass-ceramics in dentistry, materials with different compositions have been developed. However, their popularity surged after the introduction of lithium disilicate glass-ceramic in 1998, marketed as e.max® (IPS Empress® 2, Ivoclar Vivadent). As compared to feldspathic, ceramic-reinforced polymers, and leucite glass-ceramics, lithium disilicate-based materials have displayed superior mechanical properties (18), (19).

IV. CONCLUSION

Restoring fractured maxillary central incisors is challenging for many clinicians and the lack of a good clinical protocol could be a contributing factor to the unsuccessful management of such cases. Reliable and positive long-term outcomes have been observed with adhesive ceramic restorations.

Advancements in laboratory techniques have made it possible to create ultrathin handcrafted ceramic restorations that offer an extremely conservative and aesthetically pleasing solution for rehabilitating fractured central incisors. This case report of a fractured central incisor showed that such restorations were clinically successful and met the patients' esthetic requirements.

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➤ *Conflicts of Interest*

The authors declare no conflicts of interest.

➤ *Authors's Contributions*

All the authors to the production of this article. They read and approved the final version of this manuscript.

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