

Restoration of Fractured and Discolored Anterior Tooth: A Case Report

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ABSTRACT

Anterior tooth fracture is a dental structural abnormality that can lead to genuine esthetic problems. The treatment of patient with fractured and discolored teeth is very challenging. A comprehensive clinical examination involving vitality test findings, dislocation of teeth, percussion analysis findings, and injuries of periodontal tissues, is crucial to determine the appropriate treatment plan. In this article, a 24-year-old female patient consults for restoring her fractured and discolored central incisor because of its unaesthetic appearance. The fracture line's position and the tooth necrosis excluded treatment modalities such as veneers in favor of full coverage. The incisor was restored with zirconium based crown.

Keywords: Tooth fractures, Zirconium oxide, Tooth, Nonvital, Root canal therapy

INTRODUCTION

Many types of dental structural abnormalities can be observed in the anterior sectors, where they can lead to genuine esthetic problems for patients.

Some of them are congenital as amelogenesis imperfecta and Molar-Incisor Hypomineralization, others are acquired as tooth wear, tooth decay and tooth fracture [1,2].

Dental trauma may cause a wide degree of damage to anterior teeth, ranging from a mild concussion to varying amounts of lost tooth structure through fracture to the crown and/or root [3].

In addition to that, dental trauma may yield tooth discoloration with different varieties: white, yellow, brown, pink, gray, or black. Localized discolored teeth can be managed by minimally invasive treatment options such as resin infiltration, microabrasion, macroabrasion or bleaching and restorative methods when there is tissue loss such as composite, veneers, and full coverage crown [4].

Direct restoration with composite requires practitioner's skills to achieve an esthetic and functional morphology. However, composite is prone to discoloration which affects color stability. Thus, ceramic veneers offer the best solution in terms of esthetic results and represent the least invasive restorative approach. Moreover, in some cases, other alternatives as full coverage crowns should be envisaged to

restore fractured teeth and protect the residual dental structure [1,4,5].

Various factors need to be considered while developing a treatment plan for fractured and discolored teeth [6].

CASE PRESENTATION

A 24-year-old female patient attended to the department of fixed prosthodontics for restoring her fractured central incisor because of its unaesthetic appearance (**Figure 1**). Thermal and electric pulp testing revealed that the tooth was necrotic.

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Figure 1. The initial smile.

The patient's anamnesis revealed that the tooth had been fractured 2 years ago during an accident. Direct composite restorations had been placed one month after the trauma. The patient had no complaint, except for the unaesthetic appearance due to the dyschromia of the fractured incisor. A zirconia-based crown was indicated (**Figure 2**).



Figure 2. Discoloration of the central incisor.

Before tooth preparation, root canal treatment was done. The defective composite was removed and the tooth was prepared (**Figure 3**).



Figure 3. Tooth preparation.

Thereafter, a glass fiber post was placed. The esthetic core was built up with composite resin and bonded with self-adhesive bonding resin (**Figure 4**).



Figure 4. Fiber post-reconstruction.

After master impression (**Figures 5 & 6**), working cast was performed, and scanned. A zirconia-based crown was milled by CAD/CAM.



Figure 5. Master impression.



Figure 6. CAD/CAM zirconia coping.

Then, the crown was checked intraorally and the entire cementation procedure was performed. A three-month follow-up asserted complete patient satisfaction with regard to her smile (**Figure 7**).



Figure 7. Esthetic outcome.

DISCUSSION

Traumatic injuries to anterior teeth are frequently encountered in our daily practice. The tissue damage depends on the direction and severity of impact. It can be a simple fracture with loss of enamel, and it can also be a most serious injury which can reach the pulp [1].

A comprehensive clinical examination involving vitality test findings, dislocation of teeth, percussion analysis findings, and injuries of periodontal tissues, is crucial to determine the appropriate treatment plan [2].

There are many treatment options available for tooth fractures. They are mainly:

- Tooth fragment rebonding
- Composite resin restorations

- Veneers
- Full-coverage crowns

The selection of the right therapeutic option depends on the fracture line's position (**Table 1**).

Table 1. Treatment options available for crown fractures.

Classification	Description	Treatment options
S.02.50	Fracture of enamel of tooth only +enamel infraction	<ul style="list-style-type: none"> • Composite resin restorations • Porcelain veneers
S.02.51	Fracture of crown of tooth without pulpal involvement	<ul style="list-style-type: none"> • Composite resin restorations • Porcelain veneers • Tooth fragment rebonding
S.02.52	Fracture of crown of tooth with pulpal involvement	<ul style="list-style-type: none"> • Full-coverage crowns
S.02.54	Fracture of crown with root of tooth, with or without pulpal involvement	<ul style="list-style-type: none"> • Full-coverage crowns

Tooth fragment rebonding is the most conservative restorative option. However, many studies showed that rebonding of fractured fragments has a mean value of resistance to fracture that is lower than both intact teeth and teeth restored with ceramic veneers [5].

The study of Stellini [3] showed that the resistance of teeth with rebonded restorations is 54.9% of that of, intact teeth, which was lower than the resistance of teeth restored with ceramic veneers (81.8% of that of intact teeth).

Ceramic veneers showed higher resistance than fragment rebonding and esthetic qualities with a long-term outcome.

According to the study of Meijering AC et al. the survival rates were 94% for porcelain restorations, 90% for indirect composite restorations and 74% for direct composite restorations.

While ceramic veneers are the most conservative, economical and safe treatment options for the management

of fractured teeth, in some cases, other alternatives as full coverage crowns should be envisaged to restore fractured teeth and protect the residual dental structure [1].

Crown discoloration is a common sequel following trauma, teeth may become yellow, gray, brown, black, or pink [7,8].

The alteration in color may be caused by Enamel hypoplasia, Internal/external resorption, calcific metamorphosis, Dentin hyper-calcification and Intra-pulpal hemorrhage where hemoglobin and erythrocytes are released. The penetration of hemosiderin into the dentine can lead to a change in crown color [9].

This sequel evolves in more than 90% progressing to non-vitality and pulp necrosis. Also, since exposed pulp and/or non-vital teeth are sources of chronic infection and discomfort, affected teeth should be treated [10].

Treatment of localized tooth discoloration is challenging and requires a well knowledge of material properties used for

treating the tooth defect. The ability of the material to mask the discolored substrate and, at the same time, match the color of adjacent teeth is crucial to the treatment's success.

In our clinical case, the discoloration of the fractured teeth required a combination of endodontic treatment and restoration with 3Y-TZP zirconia based crown.

The study of Basegio [10] evaluating the masking ability of different prosthetic material on tooth colored resin substrates showed that samples of veneered 3Y-TZP zirconia had a better masking effect than monolithic lithium disilicate, translucent zirconia, hybrid ceramic, or heat-pressed ceramic over Translucent zirconia samples [11,12].

Additionally, inner zirconia with veneering glass ceramic could provide a suitable esthetic outcome.

CONCLUSION

The restoration of discolored and fractured teeth may require minimally invasive or more extensive treatment modalities with a multidisciplinary approach. The success of these treatments relies on good choice of the prosthetic material that can mimic mechanical properties and esthetic qualities of an intact tooth and mask the discoloration.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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