

# Multidisciplinary Approach for the Management of Orthodontic Treatment Failure

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

## Article Information

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Case Study

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## ABSTRACT

This article describes a case of full mouth rehabilitation using ceramic veneers in combination with periodontal surgical approach for the management of orthodontic treatment relapse.

A 38 -year-old female patient presented with a chief complain of poor esthetics after orthodontic treatment. She was bothered especially about her smile and was asking for its improvement. Unesthetic smile was caused by eroded maxillary incisors and old metal ceramic crowns with greyish shadow. Altered occlusal plan was also detected.

The treatment plan included endodontic re- treatment and crown lengthening followed by minimally invasive ceramic restorations including anterior and posterior Ceramic veneers.

*Keywords: Esthetic; veneers; orthodontic failure; management; full mouth rehabilitation.*

## 1. INTRODUCTION

Orthodontic treatment can play an important role in enhancing aesthetics, function and self-esteem in patient. However, when it is

bad planned, it can lead to tissues damages. It carries with the risks of enamel demineralization, direct surface alterations, teeth misalignment and treatment failure in the form of relapse [1].

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Successful management of post orthodontic relapse and damages involves controlling the four dimensions of treatment aesthetics function structure and biology. It may require a multidisciplinary approach, for full mouth rehabilitation, associating many disciplines and extensive restorations [2].

If the clinician uses a methodological based approach to diagnose aesthetic and functional problems, then the outcomes of the treatment plan will be enhanced without sacrificing the structural and biological aspects of the patient's dentition. The treatment planning sequence proceeds from biology to structure, functional, finally esthetics with a synergy between periodontics, endodontics and fixed prosthodontics therapy [3,4].

Accurate planning and detailed initial analysis of each case is crucial for achieving a reliable outcome and ensuring the long-term success of the therapy. Comprehensive facial and dental assessment should be done in an objective manner using references lines and a diagnostic wax up is an essential tool. It permits to reduce the potential for remakes. It should include all details. Teeth form, Incisal edge position, vertical dimension with a correctly positioned occlusal plan and curves are major parameters that should be correctly restored [5,6].

Recently, minimally invasive approach involving ultra-thin ceramic restorations is highly recommended; and laminate veneers can be indicated for both anterior and posterior. Due to their higher fracture resistance, they are indicated to solve the problem of erosion of posterior teeth and then correct the vertical dimension without teeth preparation. Their durability, which is around 90% and their color stability they are preferred in the aesthetic zone then resin veneers [7,8].

## 2. CASE PRESENTATION

This clinical report deals with; full mouth rehabilitation using ceramic restorations in combination with periodontal surgical approach for the management of a failed orthodontic treatment conducting to compromised aesthetics altered occlusal plan.

A 38-year-old female patient presented with a chief complaint of poor aesthetics (Fig. 1). She expressed her dissatisfaction with color and shape of her teeth, and she was bothered about the visible dark areas under old crown margins in the mandibular incisors. She reported that she

was under orthodontic treatment, seven years ago but with no satisfactory results. She also reported that she was suffering from gastric problems which can be related to deficient masticatory function.

### 2.1 Intra Oral Examination Revealed

A tooth wear with exposed dentin which was localized especially on the first mandibular molar and maxillary incisors (Figs. 2a & 2b & 3a). A moderate abrasion of incisors which tends to shorten the crowns; and as a consequence, the contact between the central incisors. Maxillary and mandibular first premolars were avulsed before orthodontic treatment.

Unaesthetic resin veneered metal crowns with greyish margins in the second left premolar and first molar were noticed (Fig. 3b). According to adjacent teeth, a discrepancy in gingival architecture, in this region was also noticeable. It was associated with the over eruption of these teeth. Mandibular incisors and canines were restored with unaesthetic metal ceramic crowns with dark margins. Occlusal evaluation showed that anterior and canine guidance were lost associated with a disturbed occlusal plan caused by tooth wear and over eruption of maxillary teeth (Fig. 3a & 3b).

In the maxillary region, Soft tissues were evaluated as healthy with a wide band of attached gingiva. Visual assessment and Periodontal probing revealed a thick healthy gingival biotype with gingival thickness of 2 mm and a sulcus depth of 2 mm. Meanwhile, there was a gingivitis localized in the mandibular incisors. Gingival display was evaluated as more than 4 mm when smiling but the patient did not express her dissatisfaction about gummy smile and refused any surgery.

Firstly, photographs were taken using CANON 700D camera and preliminary analysis were performed (Figs. 4 & 5a & 5b). This analysis offers the advantages in the following areas: esthetic diagnosis, communication and feedback. A comprehensive Esthetic assessment showed a reverse smile line, a squared teeth form and size discrepancy. Inadequate width-to-height ratio in maxillary central incisors was noticed. A non-harmonious relationship between central incisors proportions and facial form and proportions was evident. Facial analysis revealed symmetrical facial midline corresponding with the maxillary dental midline. The bicupola plan was not parallel to incisal edge plan.



**Fig. 1. Initial situation**



(a)



(b)

**Fig. 2a & 2b. Occlusal view of maxillary and mandibular arch**



(a)

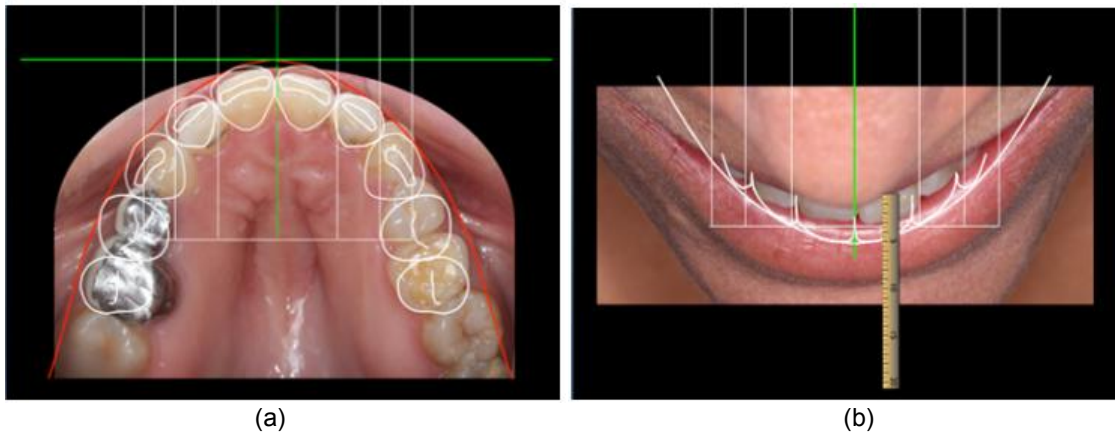


(b)

**Fig. 3a & 3b. Lateral views showing altered occlusal plane**



**Fig. 4a-4c. Lateral and frontal views**



**Fig. 5a & 5b. Preliminary aesthetic analysis**

Radiographic evaluation confirmed the avulsion of first maxillary and mandibular premolars. It shows also periapical lesions associated with internal resorption localized on mandibular incisors (Fig. 6).



**Fig. 6. Radiographic examination**

After careful evaluation, diagnostic casts were waxed. The wax-up included all the desired elements in a smile design, from tooth proportion, axial inclination and gingival zenith, incisal arrangement and embrasures, to gingival architecture, putting everything in what is called a frame of reference and occlusal plan situation.

**The treatment plan included:**

- Endodontic re- treatment of anterior mandibular teeth followed by fiber post and core build up and E max ceramic crowns replacing old ceramic metal crowns.
- A crown lengthening in maxillary posterior teeth; followed by all ceramic crowns.
- Ceramic veneers were planned for vital teeth, both anterior and posterior, in order to optimize esthetics and correct the occlusal plan.

**2.2 Clinical Procedure**

Firstly, a periodontal treatment consisting of periodontal scaling was performed (Fig. 7), old crowns, both maxillary and mandibular, were removed and replaced by handmade provisional restorations; they were performed according to the waxed casts and using acrylic resin (Texton, SS White; New Jersey, USA).



**Fig. 7. Mandibular teeth after old crowns removal and periodontal scaling**

In order to have a harmony with the gingival contours, a surgical crown lengthening was performed in the left second premolar and first molar. The provisional restorations, previously made, were refined according to new gingival margins; highly polished margins are strongly recommended for soft tissue healing which is mostly completed after eight weeks [9].

For clinical considerations, the maxillary compromised posterior teeth were restored by cast post and cores followed by Zirconia based crowns. Opaque ceramic restorations are recommended in this situation because; dark abutments may negatively affect the aesthetic value of a translucent ceramic crown conducting to a discoloration of the restoration in the cervical area.

Preparation for esthetic ceramic veneers was performed using of putty index and depth gauge burs for maxillary anterior teeth. Impression technique using retraction cords and polyvinyl siloxane material was performed. The restorations were performed using CAD/CAM procedure (CEREC in lab). Ceramic blocks with high translucency were used. Once the crowns and the veneers were received, they were carefully tried in; marginal adaptation, alignment, shape, and color were checked. A try in paste was used to select the correct resin material shade. Maxillary Zirconia crowns were cemented using glass ionomer cement and the veneers were bonded using resin material (NEXUS); and according to the protocol of Dr. Galip Gurel. The external surfaces of veneers were firstly protected from etching then internal surfaces were treated with hydrofluoric acid (60 seconds) and washed under running water and air-drying; afterward, a silane coupling agent was applied and dried (Figs. 8-11).

After rubber dam placement, enamel teeth surfaces were conditioned with 37% phosphoric acid for 30 seconds and rinsed. Next, bonding system was applied. The luting composite was tack-cured for 4 seconds to facilitate the clean-up of excess luting composite; then final light curing of all veneers for 40 seconds was performed.

Endodontic re- treatment for mandibular anterior teeth was performed. Then, remaining tissues were evaluated. They were supra gingivally located; with a height of 3 mm. They were restored with fiber post and resin material; followed by Lithium Disilicate Ceramic material IPS e.max CAD crowns (Ivoclar Vivadent; Schaan, Liechtenstein). After esthetic buildup of the abutments in the anterior mandibular teeth, preparations for glass ceramic crowns were performed using shoulder rounded bur. The

eroded first mandibular molar was prepared for occlusal veneer (Figs. 12a-18).



**Fig. 8. Ceramic veneers**



**Fig. 9. Bonded Ceramic veneers for anterior maxillary teeth**



**Fig. 10. Glass ionomer cement for zirconia crowns**



**Fig. 11. Final result in maxillary arch**



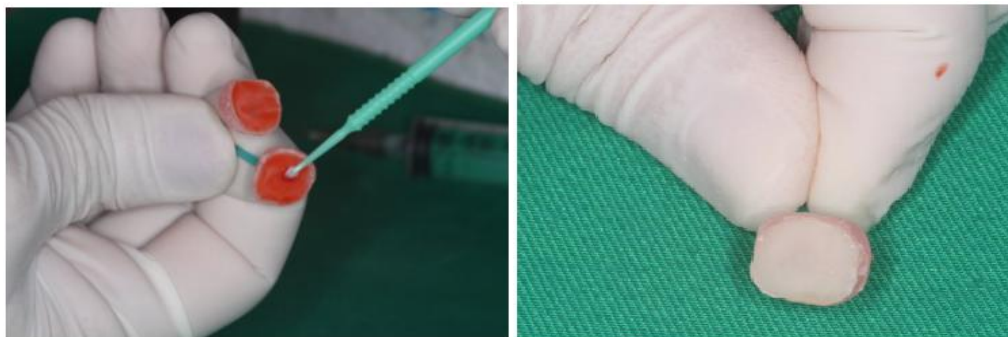
(a) (b)  
**Fig. 12a & 12b. Preparation teeth in mandibular arch**



**Fig. 13. Preparation for ultra thin occlusal ceramic veneer**



(a) (b)  
**Fig. 14a & 14b. Ultra-thin occlusal veneers: thickness 0.7 mm**



(a) (b)  
**Fig. 15a & 15b. Etching of ceramic internal surface**



**Fig. 16. Etching of tooth surface**



**Fig. 17. Bonding of occlusal veneer**



**Fig. 18. Mandibular arch after rehabilitation**



(a)

(b)





(c)

**Fig. 19a-19c. Final result showing a harmonious smile**



**Fig. 20. Final result, frontal view**



(a)



(b)

**Fig. 21a & 21b. Final result vs. initial situation**

### **3. DISCUSSION [1,2,10-20]**

The management of complex situations requires often a multidisciplinary approach; it should be correctly planned from the start by using a diagnostic wax-up to reduce the potential for remakes and laboratory costs. The main issues that must be controlled to improve predictability and meet patient expectations are smile and occlusion. Modern minimally invasive concepts of

restorative and prosthetic dentistry often impose the use of thin restorations both for anterior and posterior teeth.

Ceramics and composites present different superficial nano-texturing and which leads to different optical behavior compared to resins, ceramics are often preferred due their higher fracture resistance and color stability. In the esthetic zone this difference could limit to

indication of resin veneers. According to recent studies ceramic veneers present higher survival rate compared to resin veneers. Clinical studies report a survival rate over 90% up to 4 to 10 years of follow up.

Multidisciplinary approach is generally associated with crown lengthening which is suggested to correct the gingival architecture. It also increases the length of the clinical crown conducting to sufficient retention. Periodontal stability is, according to several studies, reached after 3 months. According to Bragger, changes occur for up to 6 months after treatment. According to Gibson et al. the period of periodontal stability has been stated about 4 months.

Modeling ultrathin occlusal veneers (MZ100 and Lithium disilicate Emax Cad) showed the feasibility of treating erosion lesions in posterior teeth with minimally invasive technique. They represent a conservative alternative to traditional onlays and full coverage crowns for the treatment of erosive lesions in the posterior dentition.

Lithium disilicate-reinforced glass ceramic when combined with immediate dentin sealing offers an intrinsic strength to thinner designs. Whenever possible, considerable importance should be given to the use of index or depth gauge burs for preparing teeth for receiving minimally invasive restoration.

Certain conditions may interfere with the survival rate and predict the appearance of clinical complication. Failures occur usually because of fractures or debonding. This can be minimized by careful selection of patient, minimal luting composite thickness, choice of effective bonding system. In addition, evaluation of occlusion is necessary. Occlusal splint, with extensive restorations, may be necessary as auxiliary preventive procedure.

#### 4. CONCLUSION

The treatment achieved a satisfactory aesthetic and functional rehabilitation. It has provided an appropriate function for the patient's quality of life, and the expected aesthetic result was obtained (Figs. 19a – 21b).

#### CONSENT AND ETHICAL APPROVAL

As per university standard guideline, participant consent and ethical approval have been collected and preserved by the authors.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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