

## ORIGINAL RESEARCH



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## Contribution to the study of improving the aesthetics of the smile by repairing and reshaping the incisors with composite materials.

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### Abstract

Introduction. Dental aesthetics, although it seems something relative and difficult to evaluate, it is governed by a series of laws and rules that connect the dental disciplines, creating a unitary whole. It is structured by rules, perfected by artistic sense and by the inclination towards beauty of all specialists in dento-facial cosmetics.

The aim of the study is to highlight an overview of aesthetic factors to consider when restoring anterior teeth with direct composite materials.

Material and methods. A total of 25 patients were included in the study where the anterior teeth were restored using Gradia Direct Anterior (from GC) and Filtek Z550 (from 3M-ESPE) composite kits, in perfect isolation using rubber dam, with a separate appointment after 24 hours for the polishing step, for which Rainbow Kit Technic and polishing Platina Hi-Gloss (from Prevest) paste were used. While the replacement of the tooth defect, we ensured that the composite increment, which we used should not be more than 2mm in thickness, and light cured for 20 seconds as the producer recommends. In none of all tooth shape modification (elongation in incisal zone) we did not modify the occlusion, by eliminating all premature contacts. All patients included in the study have signed the informed consent and agreed to participate in this research.

Results. From a total of 25 patients, we repaired 20 central incisors with the mesial (18 cases) or distal (2 cases) angles fractured, in different accidents, 5 cases with diastema by small shape of the crown or malposition of one of the central incisors.

Conclusions. Restoring the incisal angle or the incisal edge and refining a natural and improved smile of the patient is a very frequent dental intervention, especially nowadays when aesthetics plays an important role in the social society.

**Keywords:** smile, dental aesthetic, composite, incisal angle, tooth fracture.

### Introduction

With the attraction for elective dentistry, more than half of dental practitioners are concerned with branches that belong to dental aesthetics, whether it is prosthetics, orthodontics or surgery. At the same time, the number of patients requesting cosmetic dental procedures, in order to obtain a perfect smile, is increasing. So, for optimizing dental aesthetics, it is necessary to analyze all components of the face, and establish the improvements that can be made, in order to obtain a smile as close as possible to the ideal. This requires the intrinsic perception of the relationship between teeth, gums and lips and the needs or vision of the patients [1,2].

Due to the multiple variations related to age, culture, civilization, individuality, it becomes almost impossible to define the ideal smile. A perfect smile depends largely on the symmetry and balance between the characteristics of the face and those of the teeth. The colour, shape

and position of the teeth, occupy the main place in the aesthetic determination [3].

There are different features and characteristics present in the teeth which depends on various factors, as for example the gender. The female teeth have a rounder shape, manifested both by the incisal edge and by the transition lines. The incisal embrasures are also more pronounced, the incisal edge is more translucent, fact that creates the aspect of elegance [4]. The male teeth are much more angled and irregular. With age, the saturation of the teeth, in the case of men, is higher, the colour of the body of the tooth extends to the incisal edge. The incisal embrasure is squarer and not so pronounced. The individualization is strong, incorporating grey or brown cracks [5].

Regarding the age of patients, the teeth of the elderly have the following characteristics: they lack texture, are dark in colour, have a higher colour saturation, are shorter, abraded

(in smiles can be seen less), have a larger clinical crown (even if they are abraded, a consequence of gingival retractions) and are more individualized. The lower incisors exhibit straight incisal edges with dentin islands. Young individuals are at the opposite pole. The young teeth are more textured, brighter, have a low saturation, the gingival edge corresponds to the enamel-cement junction, the incisal edge is rounded so that the lateral incisors appear shorter than the central and canine, the cervical embrasures are reduced, with low individualization, usually with hypoplastic lines and spots [6].

Perceptions of colour, size, tooth shape, age and gender of the patient are based on certain prejudices that are a part of the cultural environment of each individual. Perceptual preconceptions can be divided into two categories: cultural and artistic. The use and manipulation of these preconceptions allow cosmetic dentistry to fool the eye of the observer when we consider prosthetic restorations. Proponents of these theories claim that, illusion is the art of changing perception in order to create an affiliation other than reality [7,8]. Teeth can be made to look wide, narrow, small, large, short, long, aged, rejuvenated, belonging to any gender whether it is male or female. Understanding these basic principles of perception and manipulating them in the control of illusion allow the realization of aesthetic prosthetic reconstructions [9,10].

### **Aim of the study**

The main aim of this study is to create minimally invasive, long lasting restorations, a functional and natural smile makeover by reshaping the incisal angles, the incisal line or the vestibular surface using only composite materials.

### **Material and methods**

In the present clinical study were included a total of 25 patients whose anterior teeth were restored with composites following proper technique. We have explained the important steps to all patients and they have all accepted and signed the informed consent. As we have discussed the aesthetic, anatomical and optical properties of natural tooth, an adequate technique, appropriate materials and

equipment were selected to get the best possible outcome. Here are the steps that we followed to obtain an aesthetic smile, which promoted morphology stability, health, function and biocompatibility with the surrounding tooth tissues.

#### ▪ *Composite Selection*

The Gradia Direct Anterior (from GC) and Filtek Z550 (from 3M-ESPE) composite kits were used in all the patients to restore the anterior teeth. Gradia Direct Anterior and Filtek Z550 are light-cured resin composites consisting of micro-filled hybrid. All these materials offer significant advantages in aesthetics, improved and easy polish ability, better wear resistance and fracture toughness. Additionally, they also demonstrate tooth-like color reflection and absorption which made them our first choice.

#### ▪ *Shade Selection*

In this step, we ensured that the anatomical layering technique was followed. We selected the shade of the dentin by observing the cervical third of the tooth while the shade of enamel was selected by choosing the translucency similar to the incisal third. Initial shade selection was done by matching a shade tab to the area of interest (dentin or enamel).

#### ▪ *Tooth Preparation*

The tooth preparation for direct composite restorations involves only the walls of the defect. In cases where previous failed restorations were present, we removed them alongside the weakened enamel. A stable and supportive convenience form was obtained, which also included the bevel placement. As there are no minimum depth requirements for composite preparation, the tooth hard tissue cutting was done in such a way that the material easily bonded with the tooth, giving it enough space and strength.

#### ▪ *Bonding and etching*

We have used Tokuyama Etching Gel HV for etching the enamel and dentin, which contains 39% phosphoric acid. For the bonding, in the present clinical study we used G-Premio BOND (from GC), a universal, 8th generation bonding agent which is compatible with different etching techniques namely, total-etch, self-etch and selective etch techniques

#### ▪ *Composite placement and light-curing*

The composite material was applied using incremental technique. Layer by layer, the

missing tooth part was placed and light-cured. We used this technique as it allows proper and complete anatomical build up. While the placement of the material, we ensured that the composite increment would not be more than 2mm in thickness. We light cured the build-up for 20 seconds as the producer recommends.

#### ▪ *Shaping*

Shaping is the most important step for final aesthetic appearance of a composite restoration. We used appropriate burs, discs and finishing strips to give the restoration a look of a natural teeth. When we shaped the central incisor, we evaluated the symmetry and appearance characteristics of the adjacent tooth, so that we can re-establish the ideal form. The transition lines were adequately positioned so that an aesthetically pleasing outline is obtained.

#### ▪ *Finishing and polishing techniques*

We used Kit Technic Rainbow for polishing combined with Platina Hi-Gloss (from Prevest) polishing paste.

### Results

From a total of 25 patients that agreed to participate to our study, we repaired 20 (80%) central incisors with the mesial (18 cases, 90%) or distal (2 cases, 10%) angles fractured in different accidents. 5 cases (20%) had diastema

caused by small shape of the crown or malposition of the frontal teeth or anodontia. For 12 patients (48%) we repaired the fractured angle and reshaped both the central incisors. For 10 patients (40%) we repaired and reshaped all four superior frontal incisors and only for 3 patients (12%) we repaired only the defect.

The composite placement and technique used were adequately planned. After the treatment, all the patients were completely satisfied with their aesthetics and were glad that they got the treatment done.

From all the clinical cases included in the study we present:

Clinical case no.1 is a 13-year-old boy who presented in our office due to a dissatisfaction of his smile induced by the missing of all 4 incisors. Considering the need of improving his smile, a complex treatment was recommended including orthodontic procedures (Figures 1a, 1b). After positioning the canines in the incisor place, we used composite material to create an incisor-like shape.

Color A2 (enamel) from the Filtek Z550 Kit composite was used. The surfaces were smoothed and polished so that both teeth look similar (Figure 2). The final polishing was done using discs from Kit Technic Rainbow and final smooth surface was obtained by using diamond polishing paste.



Figure 1a. Placing the canines in the central incisors position with orthodontic procedure.



Figure 1b. Image after removing the orthodontic appliance.



Figure 2. The canine's new central incisor-like shape

Clinical case no.2 represents a 37-year-old woman who presented in our office due to the dislocation of the filling applied on the 2.1 incisor and an inaesthetic shape of the lateral incisor 2.2. Considering the aesthetics, a proper contour and vestibular shape were given restoring the lateral incisor. The mesial incisal

angle of 2.1 was corrected by using layering technique. Color A2 from the Gradia Direct Anterior, composite kit was used. The surfaces of the teeth were smoothed and polished so that both teeth look similar (Figure 3). The final polishing was done by using same technique.



Figure 3. Initial and the final imagine after repairing the central incisor's 2.1 mesial angle and reshaping the lateral incisor 2.2.

## Discussions

The way we proceed with the dental treatments has changed a lot in the past decades. With a change in people's perception, there has been a growth in cosmetic dentistry focusing on various ways by which patient's smile can be improved. The people are now more aware of their aesthetic requirements and know what is best suited for them [11]. Therefore, it has become our responsibility to fulfill their needs and choose an elective aesthetic treatment option. The material which can meet all these qualities is tooth colored restorative material. Out of many materials which are available on the market, the composites have gained a lot of popularity and attention in last few years [12,13]. The

approach which will result in best treatment outcome, is where a comprehensive plan is designed to fit patient's desires. In this way patients are actively involved so that they can share what they need with respect for their smile, teeth, gingiva, and other related structures. The dentist can also discuss the requirements associated with the tooth color, shape, size, gingival contour and architecture [14].

Currently, composite resins have become the materials of choice for restoring the anterior teeth. These materials are easy to use as the entire procedure can be done in a single session. They are available in all kinds of shades which are specific for enamel, dentin and tints so that they give a natural appearance [15,16].

All the patients included in the study had relatively small to medium sized fracture or required adequate amount of smile corrections. It is also observed that the size of the defect which needs to be filled also impacts the outcome.

Usually, in class I composite restorations, due to more void formation and inadequate wall adaptation, the restoration has chances of leakage even when stiff composites are used as compared to ones which are applied by injection technique [17]. A study was conducted where a small sized and large class I cavity was filled with a real packable or a medium viscosity composite material by injection technique. All the restorations were filled by using two increments [18]. The results showed that all operators encountered more difficulty in handling the packable composite resin.

Also, it is observed that composite restorations show more porosities and polymerization shrinkage where the size of the defect is large, compared to the smaller ones. Here the drawbacks were reduced to a great extent by following the layering technique [19]. Therefore, the composite adapted well to all the walls and also between the increments by way of the spacing was very small, porosity was also reduced. These porosities and voids act as sites for microleakage or may weaken the restoration [20,21].

In another in vitro study, clinical handling characteristics were created by providing samples of a stiff composite (Herculite) or a low viscous composite (P50). The sample were designed in bulk or applied in two layers [22]. In comparison, it was seen that samples prepared with layering resulted in a significantly lower flexural strength as compared with the samples prepared by the bulk technique. However, the flexural strength reduction was significantly more for Herculite than for P50. The low viscous composite (P50) showed better adaptation to the tooth layers and in between the incremental layers, whereas the stiff composite showed cracks and voids between the increments [24,25]. Due to this, it is observed that the fracture resistance will be reduced by repeated loading against fatigue. As in our present study we used the composite in proper incremental technique so that minimal

polymerization shrinkage occurred, therefore the strength, wear resistance, flexural strength and aesthetics were adequately maintained which is in contrast with the in-vitro study [26].

In the present study we took care of all the factors related to the technique, material selection, smile design, aesthetics based on shade selection so that all the needs are fulfilled and the patients are finally comfortable, satisfied and happy with the final restoration. The anatomic form of the tooth, as well as the adjacent tooth or all four incisors were modified where necessary. The finished restorations gave an appearance of natural teeth. As the buildup was performed by using layering technique, the layers were adequately light cured so the probability of marginal fracture was reduced to a great extent. Some in vitro studies have reported higher incidence of marginal defects when Durafill and direct Herculite were used, whereas other study reported an overall incidence of 11.2% suggesting that marginal fracture is a minor, but significant, mode of failure for these restorations [27]. Overall, after completion we checked that the margins are properly finished and there is no gingival encroachment in the proximal areas. Also, all the patients were comfortable with the new restoration and none of them reported any pain and tenderness. Hence, the patients were immensely happy that composite material was used in the anterior region, as it helped to restore the tooth aesthetics and improve their functional demands.

## Conclusions

1. The most common fracture of the frontal teeth is the fracture of the mesial angle of the central incisors and most frequent to men. Repairing this defect offers the patients self-confidence, especially nowadays when aesthetics play an important role in the society.
2. The excessive removal of non-affected dental hard tissue is not necessary if the adjacent structures are not fractured or affected, and if the isolation, etching and adhesion respect the correct techniques.
3. Restoring the incisal angle or the incisal edge and refining a natural and improved smile implies a lot of well known

techniques, materials, a very precise protocole of work and, in most cases, the reshaping of two or more frontal teeth.

**Conflict of interest:** None declared.

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