


CASE REPORT

A multidisciplinary minimally invasive approach for the esthetics of the smile

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Abstract

The aim of this work is to define a new multidisciplinary pathway for dental and gingival problems. The method consists of three different instruments that can resolve dental, labial, and periodontal imperfections with minimal invasiveness.

KEYWORDS

dentistry, esthetics, face, mouth, oral cavity, oral medicine, tooth

1 | INTRODUCTION

The patient under study had dental agenesis and imperfections of pink esthetics. The technique of additive facets was used synergistically with the erbium laser and fillers, to define a multidisciplinary rehabilitation pathway for such problems. Esthetics and functionality have been restored, demonstrating that even minimal intervention may solve complex problems.

The most modern technologies available allow us to act on the patient's smile, by making it healthier and in better harmony with the face, without the need to operate in an invasive and painful way.

The new ceramics in the dental field, the lasers, and the fillers allow a multidisciplinary rehabilitation of smiles through minimally invasive techniques, by using simple, repeatable, and predictable protocols.^{1,2}

In 2008, we started working with this in mind, and we analyzed about 200 cases, taking into consideration not only the dental element but also the pink and the periodontal and labial esthetics.³

This experience has allowed us to develop a minimally invasive method called "Three-Tool Work (TTW)." This technique consists of three fundamental tools that can resolve dental, labial, and periodontal imperfections with minimal invasiveness, if combined together.

These instruments are the erbium lasers, the fillers, and the no-prep additive facets (specifically, the "minimally invasive veneers technique," MIV).⁴

In detail, the erbium laser allows to correct the gingival parabolas, the fillers allow to solve the labial imperfections, and the additive facets help to solve various dental problems such as diastemas, misalignment, enamel erosions, tetracycline, and fluorosis stains.

2 | THE CLINICAL CASE

The clinical case we are going to analyze is a 40-year-old odontophobic woman, who reports embarrassment in smiling, because of her dental situation (Figure 1A) accentuated by labial mimicry, with misfunction in the left lip.



FIGURE 1 Initial condition of the patient. A: labial mimicry and with incompetence in the left lip. B-D, interincisive diastema, dental agenesis of 22 and 12, replaced by 13 and 23, presence in the arch of 53 in position, extreme dental sensitivity due to erosions on the cervical of 14-15-24-25

Therefore, we started with radiographic examinations: an orthopantomogram and complete set of radiographs. From the clinical point of view, the patient presented: never-corrected interincisive diastema, dental agenesis of 22 and 12, replaced by 13 and 23, presence in the arch of 53 in position, extreme dental sensitivity due to erosions on the necks of 14-15-24-25 (Figure 1B-D).

The treatment plan suggested in this case included the following steps: to elongate the upper front teeth, to close the diastema, to broaden the smile line, to correct the excess of gum show and the teeth color, and recontour the lip shape.

We presented various therapeutic options to the patient, which may be eventually used also together if needed (teeth whitening, orthodontics, composite reconstructions, ceramic veneers). We opted for a technique that consists of three appointments and can be considered as a "three-step technique."

2.1 | "First step"

During the first, purely evaluative appointment, Figure graphs, X-rays, and impressions of the entire arch were performed. The initial visit ended with the registration of the facial arch/bow. Everything was then sent to the dental laboratory with the following instructions: transform the canines into laterals, the milk canine into a permanent canine, and to close the diastema.

The laboratory performed the wax up and a silicone mask or key according to the prescribed directions. In this

specific case, a correction of the gingival parabola of 53 is also required.⁵

In these cases of modifications of the gingival parabolas, the technicians simulate on the plaster model, the future correction of the gingiva on the plaster model that will then be reported on the silicone key. This is how the patient had the opportunity to see her new smile undergoing no invasive action.

2.2 | "Second step"

On the second appointment, a maxillary vestibular mock-up was performed directly in the mouth. In 2004, this simulation was named esthetic pre-evaluative temporary/APT) technique by the author.⁶

APT offers a final opportunity to discuss the outcome with the patient in terms of esthetics, function, and phonetics and, if necessary, to discuss any changes before performing the guided preparation through the model.

We loaded the silicone mask with a self-curing composite resin of the color chosen for the veneers (Luxatemp, DMG Germany), then applied it in the patient's mouth (Figure 2A,B). After removing the silicone mask, all the vestibular surfaces of the upper teeth were covered with a thin layer of composite that reproduced the definite shape of future restorations by the dental technician.

After the clinical validation of the esthetic form, of the chosen color and of the smile line, Figures of the mock-up were performed for further evaluation.



FIGURE 2 The silicone mask with a self-curing composite resin of the color chosen for the veneers is applied in the patient's mouth

At this point, the patient decided to accept and to begin the treatment.

Before starting the procedure, we assessed the periodontal condition of the 53 by probing the gingival sulcus. According to this evaluation, a laser-sculpted gingivectomy was planned, and after that, the correction of the parabola of the gingival margin of the 53 was performed using the erbium laser.⁷

On soft tissues, the laser is used with power parameters of 1.5 W and 50 mJ energy.

The laser beam is not in contact with the soft tissues, and this allows the correction of the gingival parabola without the aid of any anesthesia. The interproximal contacts between

the teeth were slightly opened where necessary by stripping with thin diamond strips (0.15 mm). The incisal edges have been finished by removing the unsupported enamel prisms; then, a final impression relief was performed with a double relief technique. The imprint was taken by using a precision silicone (Honigum Pro, DMG Germany) without any retraction cord, since the preparations were supragingival.

The high-precision impression material, characterized by excellent smoothness, was syringed on the preparations and remained in situ until the impression tray was inserted.

After the impression was taken, a composite application was made to the collar on 53 to support the new protrusion profile of the gingiva, until the restoration application session scheduled after 21 days later. No temporary restoration has been performed, as the method does not include that. Impressions, preoperative Figure graphs, and bite registration were sent to our dental laboratory team. The color of natural teeth was VITA B2 shade. Since this procedure is an esthetic-functional rehabilitation, the choice of color was shared with the patient, creating renovations with a lighter color than her original one. Specifically, the patient chooses the vita b1 shade as the final color of the desired renovation.

The patient wanted longer teeth and a wider buccal cavity. Lithium disilicate (IPS e.max Press—Ivoclar Vivadent) was chosen as a restorative material due to its excellent fracture resistance and good esthetic results (Figure 3A,B).

2.3 | “Third step”

In this third session, all the restorations were applied in the upper arch. All the veneers were pre-etched by the laboratory



FIGURE 3 The patient wanted longer teeth and a wider buccal cavity. Lithium disilicate was chosen as a restorative material due to its excellent fracture resistance and good esthetic results

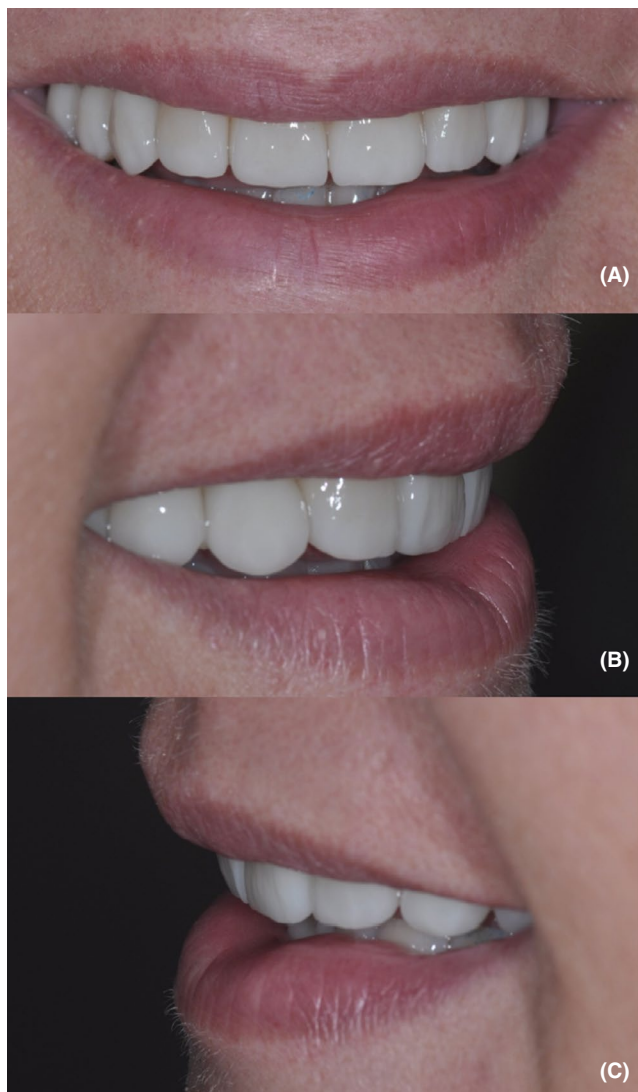


FIGURE 4 The restorations were tested using glycerin gel adhesive pastes from the cementation kit perfectly simulating the final result

by sandblasting with aluminum oxide (50 microns) and 10% hydrofluoric acid for 20 seconds. The tooth surface was etched with orthophosphoric acid for 90 seconds.⁸

The unprepared (nonmilled) dental enamel remained covered with a layer of a few microns of tissue not organized in prisms and called aprismatic.⁹

After etching with 37%-40% orthophosphoric acid, the latter did not show an etching pattern, but instead the underlying prismatic enamel subjected to this acid treatment. The consequence is that the etched aprismatic enamel offers less micromechanical retention (enamel-resin interlocking) against the cementation resin composite, increasing the risk of loss of intimate adhesion of the facet over time.

This problem has been known in adhesive dentistry for a long time, for example, in the procedures for sealing grooves and dimples. In these situations, it is necessary to let the orthophosphoric acid act for a long period of time (between

90 and 120 seconds and never less than 60) to chemically remove the aprismatic enamel without the aid of the rotating instruments, in order to remove all of the aprismatic coating, expose the underlying prisms, and then etch them. The acid etching of enamel prisms produces the typical enamel etching patterns, described by Silverstone in 1975, which can provide tenacious mechanical retention to the fluid bonding resin and to the composite resin or overlying sealant.¹⁰

The restorations were tested using adhesive glycerin gel pastes from the cementation kit (Vitique, DMG Germany), perfectly simulating the final result (Figure 4A-C).

We have given the utmost attention to this passage, due to the subtlety and translucency of the ceramic veneers.

Only when the results of adaptation and cement were satisfactory for both the clinician and the patient, the application was performed. The ceramic cores were again cleaned with water spray, and then, the veneers were cemented in situ.

The veneers were silanized with the two-bottle system (Vitique Silane, DMG Germany), to increase the bond strength. Then, a layer of adhesive was applied (Ultradbond, DENMAT Italy), both on the restoration and the tooth surface. At this point, the composite cement B1 of the same color as the veneers (Vitique DMG Germany) was applied to the restorations.

Once the restorations were finally inserted, the initial photo-polymerization was performed for just one or two seconds per restoration. A scaler can easily remove the excess of gelatinous cement.

As these cements are of hardeners type, the thickness of the ceramic negatively affects the penetration of light, reducing it up to 50% for ceramic thicknesses of 0.8 mm. For these reasons, the polymerization time is very important.

We recommend the use of lamps with a power of at least 1000 mW, with two vestibular cycles of 40 seconds and 2 cycles of 40 seconds in the lingual area. The open contact points have facilitated the adhesion procedures, from the positioning of the facets to the removal of the excess. Thin aluminum oxide finishing strips were used to smooth and polish interproximal surfaces to allow the correct use of dental floss (Diamond Strips, EDENTA Switzerland).

Subsequently, a polishing rubber (Enhance, Dentsply Sirona Restorative USA) was used to polish all the margins. After the application of the restorations (an application that takes place simultaneously), the occlusion, the protrusiveness, and the laterality were checked. The front guide has been reestablished following the principle of minimal invasiveness.¹¹

Then, the option of restoring the lower arch was evaluated together with the patient.

The vestibular view of the finished procedure is shown in Figure 5A,B. The occlusal view in Figure 6 shows the increase in an arch shape and incisal length, along with the whiter smile requested by the patient. The patient's new smile can be appreciated in Figure 7A,B.



FIGURE 5 Vestibular view of the finished procedure



FIGURE 6 The occlusal view that shows the increase in an arch shape and incisal length, along with the whiter smile that was requested by the patient

At checkup carried out after 1 week, a filler infiltration (Be filler intradermic, Micromed, Switzerland) was performed in order to improve the imperfection due to the incompetence of the left hemi-lip, and at the same time improve the labial mimicry in a general sense, as shown in Figure 8A-B.

3 | DISCUSSION

The patient stated that she was very satisfied with the treatment, both esthetically and functionally (Figure 9A-B).

The restorations were well integrated with the rest of the dentition (esthetic success), and the soft tissues were healthy (biological success).

The patient had visited 12 months after the treatment, and there was no gingival recession or any divergence between the position of the centric condyle and habitual intercuspitation.

The fact that the etched aprismatic enamel increases the risk of loss of intimate adhesion of the facet over time has been known in adhesive dentistry for a long time, for example, in the procedures for sealing the grooves and the dimples. In these situations, it is necessary to let the orthophosphoric acid act for a long period of time (between 90 and 120 seconds and never less than 60 seconds) to chemically remove the aprismatic enamel without the aid of the rotating instruments, in



FIGURE 7 The patient's new smile

order to remove everything the aprismatic coating, and to expose the underlying prisms, and then to etch them. The acid etching of enamel prisms produces the typical enamel etching patterns, described by Silverstone in 1975, able to provide tenacious mechanical retention to the fluid bonding resin and to the composite resin or overlying sealant.¹⁰

4 | CONCLUSIONS

The possibility of rehabilitating anterior and posterior sectors through the MIV technique (minimally invasive veneers),



FIGURE 8 At the checkup that was carried out after 1 wk, a filler infiltration was performed in order to improve the imperfection due to the incompetence of the left hemi-lip, and at the same time improve the labial mimicry in a general sense



FIGURE 9 Definitive result of the treatment (A—before, B—after)

together with the correction of the possible negative pink esthetics of the gingival and lips profiles through minimally invasive methods such as TTW, certainly represents a valid, simple, predictable, and repeatable therapeutic alternative.

A team of professionals and suitable instruments within the studio guarantees the patient a nontraumatic experience and excellent long-term results. The two main objectives—esthetics and functionality—have been met, demonstrating that even minimal intervention may be a reasonable solution to complex problems.

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Nothing to disclose.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTION

S. Salaris, S. Santaniello, A. Guida, G. Triestino, and N. Illuzi: performed, described, and analyzed the treatment described in the present work, and contributed to manuscript writing; F. Amenta: contributed to data analysis and manuscript writing; G. Pallotta and G. Nittari: collected data and information and were the major writers of the present work.

ETHICAL APPROVAL

CIRM Foundation ethic, scientific and medic Committee.

STATEMENT ABOUT DIGITAL PHOTOGRAPHS

The authors declare that all the digital photographs included in this work have not been modified, edited, or adulterated in any way.

DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study are available within the article and/or its supplementary material. Derived data supporting the findings of this study are available from the corresponding author on request.

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