

Excessive Gingival Display

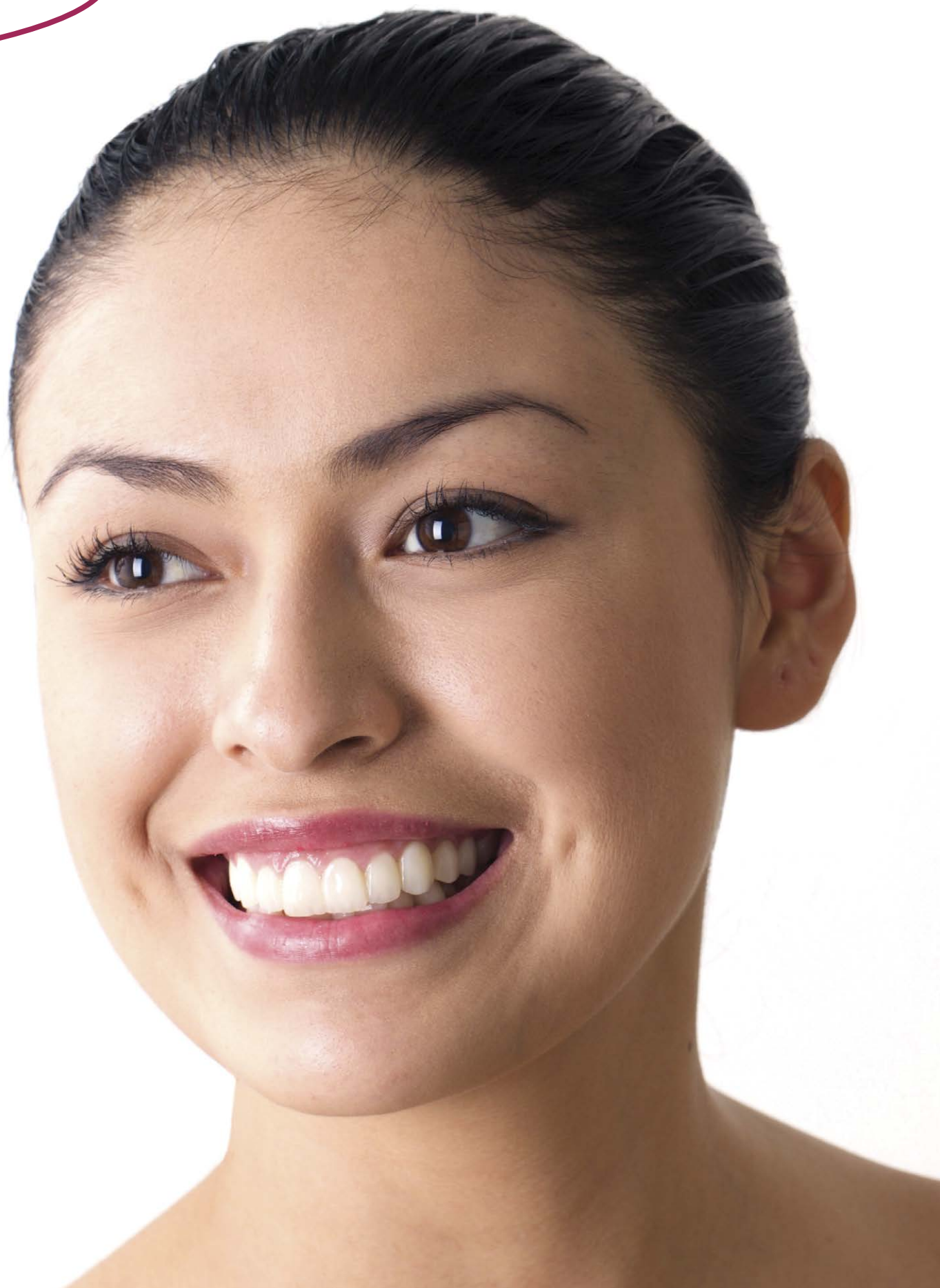
Managed with Surgical Lip Repositioning, Esthetic Crown Lengthening, and Veneers

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Abstract

Excessive gingival display, also referred to as *gummy smile*, can be managed by a variety of treatment modalities, depending on the etiology. Mild and moderate gummy smiles can be successfully treated by periodontal plastic surgery. However, for excessive gingival display as in vertical maxillary excess (VME) II or III cases with 5 to 8 mm or more of gingival exposure, this procedure is not enough. Many patients decline the more invasive Le Fort surgery and opt for a less invasive surgical lip-repositioning procedure. Therefore, surgical lip repositioning combined with crown lengthening is suggested as an effective and predictable procedure to reduce gingival display.

Key Words: excessive gingival display, lip repositioning, crown lengthening, veneers, gummy smile



Introduction

Among the biggest challenges dentists face are cases that require a multidisciplinary approach; these traditionally have been managed via invasive and long-term treatments. Depending on the case, contemporary dentistry can offer minimally invasive procedures that allow for modification of the shape of the hard and soft tissues. Current parameters indicate that a smile may be deemed “gummy” when more than 3 mm of gingiva is exposed while smiling broadly. This is considered unattractive by both dentists and patients.¹

Modifications to the shape and position of soft tissues can be made today thanks to new techniques. With these adjustments, esthetic work is not only enhanced, but the results also often go beyond patients’ expectations. Techniques such as surgical lip repositioning allow for the treatment of gummy smiles by positioning the upper lip in a more coronal location while smiling.² This procedure was first described in plastic surgery literature in the early 1970s but was not published in dental literature until some 10 years ago.³ During patient examination it is important to establish the etiology responsible for the excessive gingival display.⁴

The combination of surgical lip repositioning with periodontal plastic surgery yields highly effective results in the treatment of excessive gingival display. The combined technique can be considered as an alternative to more invasive procedures for patients who decline Lefort surgery.⁵ The authors have noted mid-term stability of the results and patients who are very satisfied that their esthetic problems have been significantly minimized.

Components of a Smile

There are four elements that should be considered before making any esthetic treatment plan: face, lips, gums, and teeth.⁶ The criteria for an “average” smile should not be interpreted as rules, but rather as biologic guidelines. It is impossible to formulate an overall rigid rule for the visual characteristics of an attractive smile.⁷ According to Ahmad, the gingival perspective is the most quantifiable and least prone to artistic interpretation.⁸ However, failing to take soft tissue considerations into account will negate all the other aspects of

treatment, resulting in ultimate esthetic failure. In the past, it was common for clinicians to focus mostly on the teeth, ignoring the rest of the facial components with which the teeth must be in harmony, even though it is these components’ successive frames that make up the esthetic composition. The face is the general or outermost frame, and the lips and the gums are internal frames. All the frames have a major influence on the final treatment result.⁸

Etiologies of Excessive Gingival Display

A gummy smile may be caused by a number of factors.⁹ Common etiologies include altered passive eruption (APE), vertical maxillary excess (VME), hypermobile upper lip (HUL), and short upper lip (SUL). Other etiologies include short clinical crowns, dentoalveolar extrusion, and gingival overgrowth.¹⁰

Skeletal

VME is a skeletal etiology. It is a condition in which there is an elongated middle third of the face, also known as *long face syndrome*.¹¹ This etiology can be diagnosed by a facial analysis and corroborated by a cephalometric analysis.¹² There are three categories of VME, which are determined by how much gum is shown while smiling broadly. VME I is classified by 2 to 4 mm of gingival exposure, while VME II is defined as 4 to 8 mm of gingival exposure, and VME III is defined as 8 mm or more of gingival exposure (Fig 1a).

Dentoalveolar Extrusion

Gingival display also increases when there is supraeruption of the anterior maxilla or enlarged alveolar processes (Figs 1b-1d).¹³

Muscular

SUL and HUL are muscular etiologies. HUL is when muscular hypertonicity generates strong labial retraction.¹⁴ SUL is when the upper lip is too short (Fig 1e).

Periodontal

Sources of gingival overgrowth include periodontal diseases such as hereditary gingival fibromatosis, systemic illness, and the use of certain medications (Fig 1f).¹⁴ APE is a state in which the apical migration of the gingiva over the teeth is incomplete and the gingiva remains coronally positioned on the tooth surface, producing a short clinical crown height (Fig 1g).

According to Ahmad, in normal circumstances, the dentogingival complex is located near the cemento-enamel junction (CEJ), with the free gingival margin (FGM) slightly concealing the anatomical crown.⁸ In APE, the FGM is located more incisally or coronally over the enamel, resulting in short clinical crown lengths and a gummy smile (Fig 1g).

Retardation of the passive eruption phase of tooth eruption causes the excessive gingival coverage of the anatomical crown seen in APE. Coslet’s APE classification states that there are two morphological types (Types 1 and 2), each with two subdivisions (Subtypes A and B). The FGM is in a more coronal position in both types.¹⁵

“...failing to take soft tissue considerations into account will negate all the other aspects of treatment, resulting in ultimate esthetic failure.”



Figures 1a-1i: Twelve examples of different factors, or combinations of them, causing a gummy smile. a) VME III. b-d) Dentoalveolar extrusion. e) SUL. f) Hereditary gingival fibromatosis. g) Altered passive eruption. h, i) Dentoalveolar extrusion due to protrusive bruxism.

- **Type 1:** This has a wide band of keratinized attached gingiva with a grossly apical location of the CEJ in relation to the alveolar crest.
 - *Subtype 1A:* The distance from the CEJ to the bone crest is within the norm of 1.5 to 2 mm.
 - *Subtype 1B:* The CEJ is almost coincident with the alveolar crest.
- **Type 2:** The keratinized gingiva is narrower and the mucogingival junction closer to the CEJ, which could be attributed to a failure of active or passive eruption.
 - *Subtype 2A:* The distance between the CEJ and the alveolar bone is normal.
 - *Subtype 2B:* The CEJ almost approximates the alveolar crest, allowing little space for the epithelium and connective tissue attachments.¹⁶

Dental

In cases of protrusive bruxism, clinical crowns appear short, and the mucosa-to-tooth ratio is not optimal. Protrusive bruxism diminishes the clinical crown height through abrasion and, usually, the periodontium responds by dentoalveolar extrusion (Figs 1h & 1i).¹⁷

Very often a gummy smile stems from more than one etiologic factor occurring simultaneously. Depending on the etiology or etiologies identified, treatment may include periodontal plastic surgery, lip repositioning, orthodontics, orthognathic surgery, or a combination of more than one procedure.¹⁸

Case Report

Patient Complaint, Evaluation, and Treatment Plan

A 20-year-old female presented to the authors' practice concerned about her gummy smile and the shape of her teeth. She stated that she avoided smiling due to the appearance of her teeth and excessive gingival display, which averaged approximately 7 mm.

The facial analysis determined the patient had well-proportioned facial thirds. Therefore the etiology of her gummy smile apparently was not skeletal and she did not have VME (Fig 2). Upon examination, the cephalometric diagnosis indicated Class I, Type I (Figs 3 & 4) and APE type 2A,¹⁵ corroborating the absence of VME. The patient also displayed a regular lip length and HUL (Fig 5).¹⁹

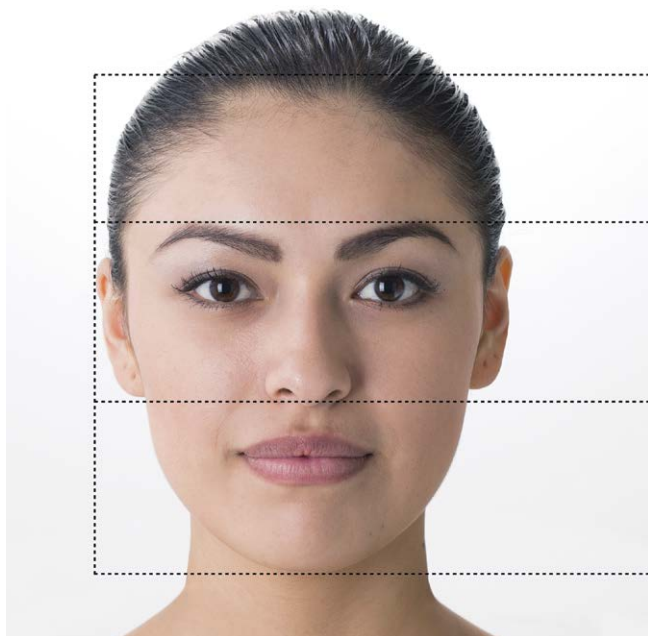


Figure 2: Preoperative full-face view with analysis of the facial thirds.

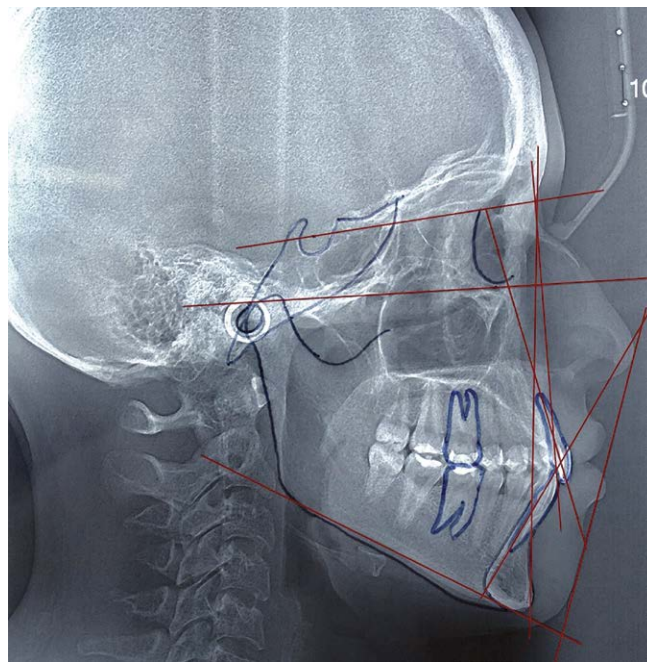


Figure 3: The cephalometric diagnosis indicated Class I, Type I.



Figure 4: Preoperative full-smile view showing excessive gingival display.



Figure 5: Preoperative retracted view.

A combination of surgical lip repositioning with periodontal plastic surgery for pink esthetics was planned to reduce the patient's excessive gingival display. The placement of veneers from teeth #4 to #13 was also planned to rectify anterior white esthetics and to improve the shape, proportion, and position of the teeth since she declined any other treatment option. It was decided to perform indirect composite veneers due to the excellent esthetic results and longevity of contemporary nano-composites.

Treatment

Lip repositioning: The lip-repositioning procedure began by anesthetizing the affected area. As in the conventional technique, a partial thickness incision was made along the mucogingival junction.²⁰ A second parallel incision was made at

the labial mucosa approximately 10 to 12 mm from the first incision. The two incisions were connected at the mesial line angles of the maxillary first molars to create an elliptical outline (Fig 6). In most cases, including this one, it is preferred to preserve the frenum in order to maintain proper alignment of the lip midline with the dental midline. The epithelium was removed from the incision outline, leaving the muscle fibers exposed. The fibers were bundled every 5 to 7 mm with synthetic, braided sutures (4-0 Vicryl, Ethicon; Somerville, NJ) and the bundles sutured to the periosteum (Fig 7). Work with the upper lip levator is done without touching other muscles, such as the buccinator and orbicularis oris, because the goal is to limit the lifting of the lip, but not affect the rest of its mobility.²¹ Finally, the edges of the initial incision were sutured with the 4-0 Vicryl (Figs 8-10).



Figure 6: Elliptical partial thickness incision of the labial mucosa.

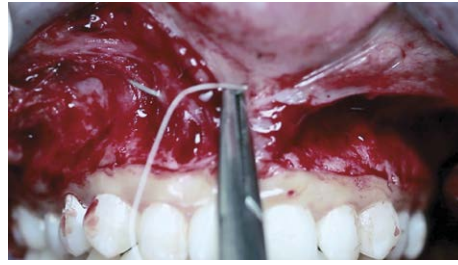


Figure 7: Muscle fibers bundled every 5 to 7 mm and sutured to the periosteum.



Figure 8: Edges of the initial incision sutured with 4-0 vicryl.



Figure 9: Retracted view 10 days after the procedure.



Figure 10: Full-smile view three weeks after the procedure.

All this work on muscles is an innovation to the conventional technique to improve the effectiveness and predictability of the procedure, and is based on techniques used in plastic surgery to treat facial expression muscles.²²

Gingivectomy: The procedure was performed four weeks after surgical lip repositioning. After anesthetizing the area, a surgical guide was created. With the tip of an explorer, reference marks were made to indicate the zenith points of the new gingival contour, being careful to preserve as much of the existing keratinized tissue as possible (Fig 11). Beveled incisions were used to create the new gingival edge. Clean cuts were made while creating a suitable architecture for the new gingival contour (Fig 12). Recontouring was done with a new scalpel blade. To ensure efficient cutting with clean edges, the blade was replaced with a new one after three pieces of tissue were cut. After completing the incisions, the gingival tissue was removed using intrasulcular incisions to sever the junctional epithelium and connective tissue if necessary.

TIPS

Beginner

- Contemporary indirect composite veneers deliver increased esthetics, strength, and durability, combining scientific principles for increased longevity.
- The mock-up is an important tool for achieving the most conservative enamel preparation.

Intermediate

- Maintenance of periodontal health and longevity of the dental restoration can be ensured by respecting the biologic width.

Advanced

- The primary diagnosis should be corroborated with the cephalometric diagnosis.
- A surgical guide can be used to easily make the reference marks of the desired gingival contour.



Figure 11: Reference marks indicate the zenith points of the new gingival contour.



Figure 12: Beveled incisions create the new gingival edge.

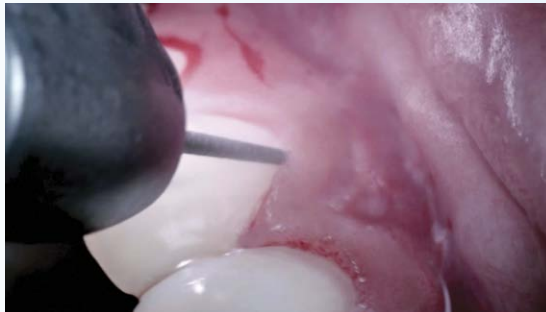


Figure 13: Margins are prepared that will serve as a reference for osteoplasty.



Figure 14: The gingival flap is lifted in order to proceed with the osteoplasty.



Figure 15: Recontouring of the crestal bone is carried out to reestablish the biologic width.



Figure 16: Remeasuring ensures that the biologic width has been properly reestablished.



Figure 17: Repositioning and suturing of the mucoperiosteal flap with 4-0 vicryl.



Figure 18: Retracted view of the completed procedure.



Figure 19: Anatomical wax-up performed on a cast to create a matrix and make a mock-up.

Recontouring: With the gingivectomy complete, the new shape and height of the gingival contour were used to prepare margins that would serve a double purpose: they would not only serve as the final preparation margins for the veneers, but also as a reference for the recontouring and osteoplasty of the alveolar bone crest, which must be performed immediately.

These margins are of vital importance because they serve as a guide for maintaining the biologic width (Fig 13). After the margins were prepared, the gingival flap was lifted to proceed with the osteoplasty (Fig 14). Recontouring of the crestal bone was carried out maintaining the crestal bone margin at a 3-mm distance from the prepared margins, reestablishing the biologic width (Fig 15). It is important to recreate an adequate archi-

ture, shape, and volume of the crestal bone, as this ensures long-term marginal stability. By respecting the biologic width, gingival tissue growth or recession can be prevented.

The new bone contour was remeasured to ensure that a distance of 3 mm was maintained after osteoplasty (Fig 16). This measurement must be taken radially, placing the probe over the center of the tooth and rotating the probe over this axis and the new edges. Probes calibrated to 3-mm intervals were used to make the measuring easier and eliminate the risk of error. The procedure was completed with repositioning and suturing of the mucoperiosteal flap with 4-0 Vicryl (Figs 17 & 18).²³

Preparation and impression: An anatomical wax-up was performed on a cast (Fig 19), and a matrix was created to make a mock-up to obtain the needed space for the veneers and achieve the most conservative enamel preparation.²⁴ Tooth preparation was followed by using a round-end tapered coarse diamond bur (900-7255, Maxima, Henry Schein; Melville, NY). In this case this work was done almost entirely on the mock-up material (Fig 20), then the excess was removed (Fig 21) and the margins were prepared creating rounded shoulders (Fig 22). Sharp corners and line angles were rounded using a round-end tapered diamond fine bur (900-7256, Maxima), followed by an ultra-fine grit diamond (701-1598, Meisinger; Centennial, CO) to smooth out the preparations. The double-cord technique was performed using two plain knitted retraction cords (000 and 1, Ultrapak, Ultradent Products; South Jordan, UT) (Fig 23).²⁵

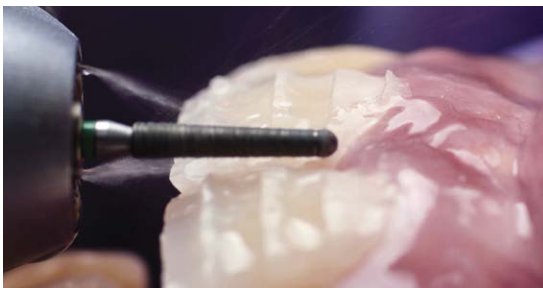


Figure 20: Conservative preparations on the mock-up.

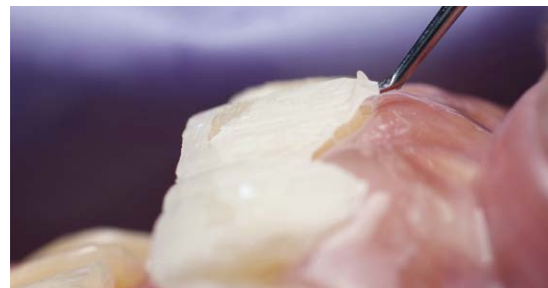


Figure 21: Removal of the excess. Work was done almost entirely on the mock-up material.



Figure 22: Smoothing out the preparations with an ultra-fine grit diamond.



Figure 23: Double-cord technique using two plain knitted retraction cords.

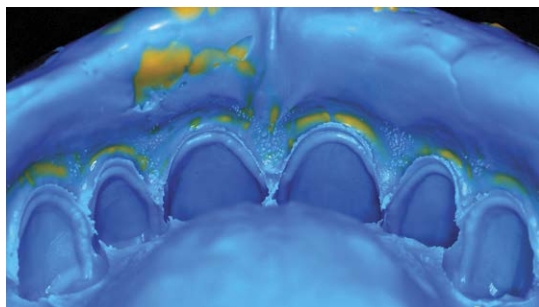


Figure 24: Impression using heavy-body and light-body normal-set PVS impression material.



Figure 25: Veneers completed and placed on the model to test fit and function.



Figure 26: Preoperative full-face view.



Figure 27: Postoperative full-face view.

After removing the second cord the impression was made using heavy-body and light-body normal set polyvinyl siloxane (PVS) impression material (Elite HD, Zhermack; Badia Polesine [RO] Italy) (Fig 24).

The finished indirect composite veneers were tried and adjusted for fit of proximal contacts and repolished (Fig 25). Prior to bonding, the veneers' internal surface was sandblasted with 110-μm aluminum oxide (Zetasand, Zhermack). The veneers also were washed in distilled water for five minutes in an ultrasonic bath to remove possible residual resin and sand left over from the sandblasting process.

The vast difference from before to after treatment and how effective the combination of surgical lip repositioning with esthetic crown lengthening can be to reduce excessive gingival display, are evident (Figs 26 & 27). The 2-year follow-up showed stability of the results and periodontal health (Figs 28-31).

Summary

One of the biggest challenges that dentists face is cases that require a multidisciplinary approach, which have traditionally been managed using invasive and long-term treatments. The combination of surgical lip repositioning with periodontal plastic surgery yields, in the short term, highly effective results for the treatment of excessive gingival display (gummy smile) and shows promise as an alternative treatment to more invasive procedures. An appropriate diagnosis of the etiology, which may include simultaneously occurring factors, is paramount to planning an effective treatment. Certain modifications of the conventional lip-repositioning procedure based on some techniques used in plastic surgery, which include working on the muscles, enable improved predictability and stability.

Although the long-term stability of the results remains to be seen, the prognosis is acceptable and the patient's esthetic problem has been minimized.



Figure 28: Preoperative full-smile view.



Figure 29: Two-year follow-up showing the stability of the results.



Figure 30: Postoperative full smile view.



Figure 31: Postoperative retracted view.

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