

# ORTHODONTICS & ESTHETIC DENTISTRY: MISSION POSSIBLE!

## A Broader Approach to Interdisciplinary Esthetic Treatment

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**AACD 2016 TORONTO: THURSDAY MORNING "TRIPLE PLAY!" One Session. One Theme. Three Big Hitters.** Dr. David M. Sarver, along with Dr. J. William Robbins and Dr. Jeffrey Rouse, will "cover the bases" on diagnosis, decision making, and treatment planning. These three "big hitters" will be presenting sequentially in the same room on Thursday, April 28, 2016. Dr. Sarver will present "*Orthodontics—How it Has Changed and What You Really Want to Know!*" This article discusses how orthodontics is incorporating smile design principles into its overall functional and esthetic treatment goals.

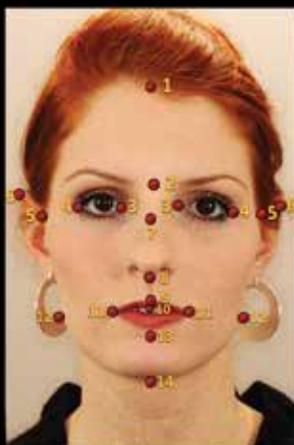
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### Abstract

For decades, dentistry has been evolving into a profession that is extremely multifaceted and varied in its approach to both smile and facial esthetics. The coordination of macro esthetics (the face), mini esthetics (the smile), and micro esthetics (the dental esthetic component) offers a complete approach to esthetic planning. This article presents an expanded vision of esthetic treatment designed to take readers to another level of facial, smile, and dental esthetic planning that can elevate patient outcomes.

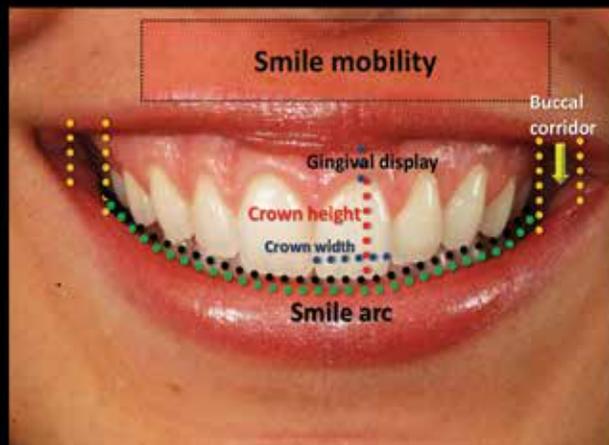
**Key Words:** macro esthetics, mini esthetics, micro esthetics, orthodontics, smile design



**Macro Esthetic Landmarks**

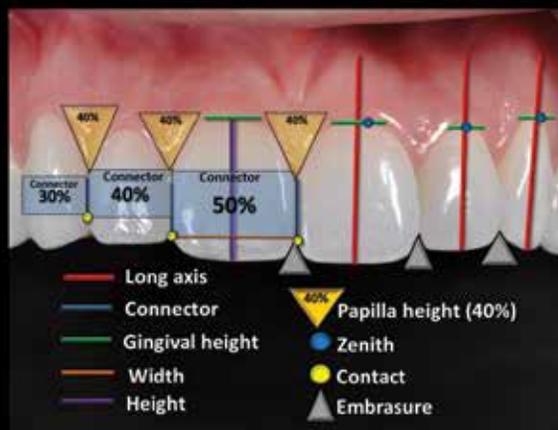
- 1 Trichion
- 2 Soft tissue nasion
- 3 Inner canthus
- 4 Outer canthus
- 5 Zygomatic width
- 6 Outer helix
- 7 Mid-dorsum of nose
- 8 Base of nose
- 9 Upper lip vermillion
- 10 Philtral tubercle
- 11 Outer commissure
- 12 Gonial width
- 13 Labiomentral sulcus
- 14 Inferior symphysis

Macro esthetics



Mini esthetics

**Micro esthetics**



**Figure 1:** In both multidisciplinary and orthodontic diagnosis, three esthetic divisions are advocated: macro esthetics (the face), mini esthetics (the smile), and micro esthetics (the teeth).

**// ...there are principles of cosmetic dentistry that orthodontists can use to enhance their work to provide a superior esthetic outcome. //**

## Introduction

Patients seeking esthetic treatment today wish to enhance their appearance for improved self-esteem and quality of life. I advocate use of the term *appearance* in conjunction with the term *esthetics* because it involves a broader assessment of the patient than just the smile (the esthetics of the smile is important, but the patient's appearance is how they look to others).

Interdisciplinary treatment has become a very important part of the practice of dentistry, and the possibilities for a more inclusive approach to diagnosis and treatment have expanded at an exponential rate. What we can offer our patients now is so much more than just smile design. While patients may seek to correct their bite or other functional issues, the fact is that a great majority of patients are coming to our offices to enhance the appearance of their dentition, smile, and face.

Dental and orthodontic diagnosis and treatment planning have merged much more closely over the past decade. This article and my presentation in Toronto will describe how, in orthodontic diagnosis and treatment planning, I have created an approach to evaluation divided into three categories (Fig 1). The descriptive process was arrived at by borrowing a set of terms from Morley and Eubank in which they described the macro esthetics of smile design.<sup>1</sup> I have expanded it to include a broader approach to esthetic treatment.<sup>2</sup> The three major divisions are as follows:

- *macro esthetics* (the profile and vertical facial dimensions, i.e., the face)
- *mini esthetics* (the smile's attributes, e.g., buccal corridors, smile arc, incisor display)
- *micro esthetics* (the teeth and their many attributes, e.g., contacts and connectors, embrasures, gingival shape and contour).

The key in this fundamental approach to esthetic analysis is the systematic analysis of all the facial and smile components, both anatomically static and functionally dynamic. This leads to a greater appreciation of the subtle interactions of each of the facial elements and how each can be appropriately managed through a unified treatment approach.

In cosmetic dentistry, orthodontics, and orthognathic surgery, if the esthetic outcome is not satisfactory to the patient they consider our work a failure. Orthodontists do not perform cosmetic dental procedures such as composite bonding, veneers, and crowns. However, we all recognize that in some instances when orthodontic treatment is completed, not all smiles look "right." Not all patients want or can afford veneers, and certainly not all need them. But there are principles of cosmetic dentistry that orthodontists can follow to enhance their work to provide a superior esthetic outcome.<sup>3</sup>

This article's goal is to illustrate how orthodontics has incorporated the principles of smile design from esthetic dentistry into how we treat our orthodontic patients. Of greater interest to the esthetic dental audience, however, is how a well-planned, well-coordinated multidisciplinary treatment plan can yield results that are exponentially greater than what one individual can achieve. It is important for all members of the interdisciplinary team to understand what the other members bring to the table in terms of enhancing the overall outcome. This mutual understanding of each other's capabilities and responsibilities facilitates synchronization of the overall treatment plan to deliver the best outcome with a minimal amount of time and burden for the patient. I believe that this works best if the team has a "quarterback." The football quarterback knows what routes the receivers are going to run, where the left guard is going, what the right guard's duties are, and what the other team's defense is presenting to them. That adds up to a winning team, and the selected interdisciplinary team "quarterback" should have that depth of understanding to be able to effectively solve problems.

**// What we can offer our patients now is so much more than just smile design. //**

## Case 1: Proclined Anterior Teeth

Imagine a patient who has undergone routine orthodontic treatment. Class I occlusion is obtained, and the teeth are nice and straight. Despite this, however, the smile simply does not look “right.” Is the only answer cosmetic enhancement via veneers? Or are there things that we as orthodontists can do as part of our treatment, first learning then utilizing the principles of cosmetic dental smile design to deliver a better result? The 22-year-old patient shown in **Figure 2** had received orthodontic treatment as an adolescent, and was not pleased with her smile outcome. A mini esthetic analysis identified the smile elements that fell short of ideal: an incomplete incisor display and a flat smile arc<sup>4-6</sup> (**Fig 3**). She had also noticed that her anterior teeth were proclined, or flared anteriorly (**Fig 4**).

Our office’s routine records include the oblique view in our photographic images because it reflects the way patients are seen by others, in contrast to the usual imagery in orthodontic and esthetic dental practices, which depicts the frontal smile only. In orthodontics, the most common way to address the issue of upright or proclined incisors is through premolar extraction to create space to retract the incisors and upright them. Due to profile considerations, however, this was not an acceptable option for this patient, so we recommended tooth size reduction through enamelplasty to create the space needed to upright the incisors sufficiently. This is an excellent option in selected cases where the teeth are of appropriate size and shape to benefit from the reshaping.<sup>7</sup>

The first step was to orthodontically align the teeth and eliminate all rotations, because they made it difficult to accurately judge the true width of the anterior teeth. Once initial alignment was achieved, we assessed the height-to-width ratio, incisal and gingival embrasures, connector lengths, and general shape and contour of the incisors. Then, using an air-rotor stripping bur, we performed interproximal reduction to create space and to esthetically reshape the teeth. Because the patient had previously undergone orthodontic treatment and had no overjet, the mandibular incisors were also reduced in width (**Fig 5**). The teeth were reshaped using the air-rotor stripping bur and the resulting space was orthodontically closed. The teeth can be reshaped by the esthetic dentist but I prefer to manage this myself because, prior to treatment, I have already visualized where I will be moving the tooth, and the esthetic dentist would have to guess as to what my plan was. In addition, enamelplasty is performed incrementally, because once enamel is removed it cannot be put back. For example, we may remove some of



**Figure 2:** Having undergone orthodontic treatment during adolescence, this 22-year-old patient had grown displeased with her smile.



**Figure 3:** Her mini esthetic analysis demonstrated incomplete incisor display and a flat smile arc. The smile arc is defined as the curvature of the maxillary occlusal plane and anterior teeth (yellow line) relative to the curvature of the lower lip (white line). In the ideal smile arc the two are consonant, or parallel.



**Figure 4:** This 45-degree angle, or “social” view, shows clearly that the maxillary incisors were proclined, or flared anteriorly. This is considered unesthetic by most people.

the width of the tooth, close the space, and then reassess for further enamelplasty. Also, it is important for orthodontists to note that in this particular case the space closure was done on round wire so that the incisors rotated palatally around the rotation point in such a way as to upright the teeth, which also increased the incisor display (Fig 6). The final outcome was a dramatic improvement in smile esthetics (Figs 7a-7c).

### Synchronization Plan

Synchronization with the dental office in this case was fairly minimal because there were no veneers or any other type of cosmetic dentistry planned. The anterior teeth can be reshaped by the orthodontist or by the dentist. If either of them is reluctant to reshape teeth, we recommend that a “set-up” be performed first. This is similar to a wax-up, but a set-up is performed by creating plaster models of the patient’s existing teeth and segmenting each tooth so that they can be reshaped, reset, and waxed to the proper position. This serves as a “virtual walk-through” of the procedure before any enamel is permanently altered. The important point is that the teeth be completely aligned so that visualization of tooth proportionality is accurate before any reshaping is done. Once orthodontic treatment is complete, a normal retention pattern is implemented with a Hawley retainer or Essex-type retainer.

### Take-Home Message

Rather than just “straightening teeth,” the principles of esthetics were applied in an orthodontic case with the goal of taking the outcome from good to great. Orthodontic treatment was utilized versus veneers, leaving the patient with an intact tooth structure, the option that most of us would want for our children.



**Figure 5:** Enamelplasty of the maxillary incisors was planned to improve the height-to-width ratio and lengthen the connectors, thus reducing the large incisal embrasures. Because the patient had no overjet, reshaping was extended to the lower incisors as well as the maxillary incisors to accommodate retraction of the latter.



**Figure 6:** This illustration demonstrates how subsequent space closure after enamelplasty results in retraction of the maxillary incisors. The incisors rotate palatally on round wire in such a way as to increase incisor display and improve the smile arc.



**Figure 7a:** The patient’s dramatically improved smile esthetics.



**Figure 7b:** The close-up smile image demonstrates the increased incisor display, improved proportionality, and improved smile arc.



**Figure 7c:** From the oblique view, the maxillary incisors were upright, and her concern about the flare of her anterior teeth was addressed successfully.

## Case 2: Severely Worn Incisor and Short Lateral Incisors ◆

The adult female patient shown in **Figure 8** was referred by her dentist for preparation and placement of porcelain veneers. The severely worn upper left central incisor needed to be intruded, and the lateral incisors were disproportionately short (**Fig 9**). Her maxillary incisor alignment also fell short of an ideal smile arc. The dentist may utilize a mock-up and temporary try-in so the patient can get a feel for the esthetics and the functional aspects of the restoration. We often perform a computer mock-up on the initial visit to begin to model the patient's idea of what might be accomplished, and also so we can visualize where to make recommendations and alterations. Computer imaging is also helpful in modeling the patient's expectations.<sup>8</sup> In this visual mock-up (**Fig 10**), we normalized gingival levels and lengthened the incisors to hit the ideal target, the smile arc. We initiated orthodontic alignment and, to facilitate visualization of where the patient was in treatment, we took a page from cosmetic dentistry and used crown formers and composite to add length to the four maxillary incisors. While her smile was greatly improved (**Fig 11**), we believed that by using some of the principles presented in the previous case, an even more outstanding result could be achieved. Therefore, we reduced the width of the maxillary incisors through enamelplasty (**Fig 12**) and closed space on a round wire to increase incisor display and the curvature of the anterior maxillary occlusal plane. In the final result, the incisor shape was excellent in all proportions (**Fig 13**) and the patient's smile was enhanced dramatically (**Figs 14a & 14b**).

### Synchronization Plan

To facilitate treatment with the dental office, we find it very useful to forward digital images of our temporary restorations to the dentist so they can see what was underneath the composite I placed and what tooth structure was underneath. In this way, they can exchange the temporary composite for more esthetic and durable materials.



**Figure 8:** This patient had a severely worn maxillary left central incisor and was referred for orthodontic preparation for porcelain veneers.



**Figure 9:** The close-up smile image also showed that the gingival margins were uneven between the right and the left sides. Commonly, the orthodontist is asked to align the gingival margins so that the veneers can be placed with the appropriate height-to-width ratio. Note that her maxillary incisor alignment also fell short of an ideal smile arc.



**Figure 10:** To demonstrate our treatment goals to the patient, we perform a digital mock-up. This exercise also allows us to visualize the desired normal tooth size and smile arc.

**Take-Home Message**

Visualization is an exercise and skill that all esthetic dentists must possess. This case illustrates the use of digital imaging for visualization and serves as a powerful tool in communicating treatment goals to the patient. The wax-up process in dentistry is very common, as is the use of temporaries to assess speech, esthetics, and function before the final product is delivered. In our practice, the use of composite is called the “orthodontic mock-up” and is no different from mock-ups for veneers; it is simply transferred to the orthodontic arena. In the end, this patient’s dentist planned to replace the composite with much more esthetic materials and the patient is currently considering porcelain veneers. The prerestorative orthodontic phase accomplished two things of great benefit to the dentist: increased incisor display to work with and appropriate anterior tooth proportionality.



**Figure 11:** Composite was bonded to the incisal edges to allow evaluation of the incisal edges on smile, and to assess tooth size proportion. After orthodontic alignment, the gingival margins were placed vertically in the proper position, but the smile arc was still flat.



**Figure 12:** To improve the smile arc, interproximal enamelplasty was performed, resulting not only in the desired space to create space for retraction of the incisors, but also improved height-to-width relationships.



**Figure 13:** Final retracted image.



**Figure 14a:** Final full-face smile, with consonant smile arc and full incisor display.



**Figure 14b:** Final close-up smile, with ideal smile esthetics and tooth proportion.

### Case 3: Diminished Incisor Display ◆

This adult female patient wanted a more youthful smile, which we identified as necessitating more tooth display on smile (Figs 15a & 15b). In the initial evaluation, we offered her several options:

- orthodontics and orthognathic surgery to downgraft the anterior maxilla to provide greater incisor display
- porcelain veneers to add some length to the maxillary teeth
- a combination of orthodontics to extrude the maxillary anterior teeth, followed by veneers.

The patient did not wish to pursue the orthognathic option, and instead agreed to the use of orthodontic fixed appliances to extrude the maxillary incisors as much as possible (while simultaneously intruding the lower incisors). Midway through treatment, we evaluated the height-to-width ratio of her central incisors, noting that the maxillary central incisors were disproportionately wide with an excessive gingival embrasure (Fig 16). Adding length to the maxillary central incisors could improve the height-to-width ratio, but in looking at the shape of the teeth we recognized the sizable gingival embrasure. We added composite to the incisal edges (as in the orthodontic mock-up) and removed enamel on both the mesial and distal of the centrals (Fig 17). This yielded better tooth form, as well as space with which we could upright the maxillary incisors and increase incisor display (as in Case 1). When we believed the limit of maxillary anterior extrusion had been reached (Fig 18), we referred her to her dentist for wax-up and finalization of treatment. The dentist approved removal of the appliances and finished with maxillary porcelain veneers (Figs 19a & 19b).



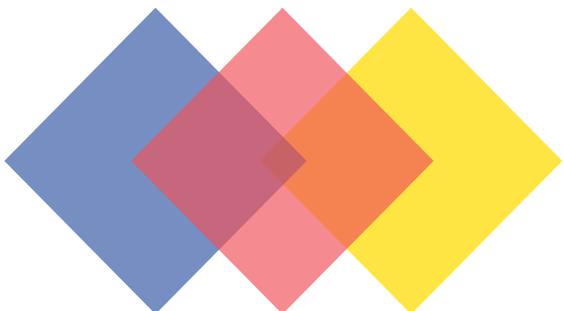
**Figure 15a:** This patient presented desiring an improved smile, but could not be specific about what she did not like. We observed that upon smile, she had very limited incisor display.



**Figure 15b:** Upon clinical examination, she showed only 3 mm of incisor on smile, while her crown height was 9.5 mm.



**Figure 16:** The maxillary incisors had short connectors and large gingival embrasures because of the greater width of the central incisors.



### Synchronization Plan

Once the maximum extrusion allowable in this patient's alveolar bone had been reached, it was retained for three months before referring her to her dentist's office for a final evaluation and wax-up if needed. The preparations were done and the temporaries fabricated as a single unit. Once the individual veneers were situated, we placed an Essix-type retainer that extended over the height of contour to maintain the vertical position of the incisors. Another option to ensure maintenance of extrusion is to, prior to impressions for an Essex retainer, place bonded attachments (much as in aligner-type cases) before the retainer impression is taken. Then, when the Essex retainer is fabricated, it engages these attachments when fully seated to maintain their vertical position.

### Take-Home Message

When evaluating smiles, esthetic dentists might not often consider orthodontic extrusion or intrusion of incisors. Orthodontists routinely use these dentoalveolar movements in adolescents, but not very often in adult patients. However, alveolar bone is modifiable to a degree even in the adult, and may be considered an option in the multidisciplinary treatment plan.



**Figure 17:** In an orthodontic mock-up, composite was added temporarily to the incisal edge while enameloplasty was performed to reduce the width of the incisors.



**Figure 18:** When the limit of maxillary anterior extrusion had been reached, we referred the patient to her dentist for finalization and wax-up.



**Figure 19a:** Porcelain veneers were placed, with outstanding smile esthetics.



**Figure 19b:** The patient's close-up smile demonstrates greatly increased incisor display and enhanced smile attributes.

## Case 4: Congenitally Missing Maxillary Lateral Incisors

This adult female patient (Fig 20a) consulted a cosmetic dentist about the possibility of a smile makeover with veneers. She was referred to our office to see what we could do to improve the potential outcome. The patient was congenitally missing her maxillary lateral incisors. When she was an adolescent, an orthodontist had placed the canines in the lateral position and her dentist added composite to the mesial and the distal incisal edges to camouflage the canine tip, rendering an approximate incisor shape (Fig 20b). However, the width of the laterals was now greater than that of the centrals and the shade of these teeth was also darker, as happens in many canine substitution cases (Fig 21).

Our first step was to place fixed appliances and align the teeth prior to reshaping the canines. In reshaping the canines,<sup>9,10</sup> we removed the composite material and visualized the shape of a lateral incisor and its height-to-width ratio compared to the canine. Figure 22 illustrates the areas in which enamel needed to be removed on the mesial, distal, and incisal aspects of the canine to get the proper height-to-width ratio, as well as the tooth's shape and form. When removing the enamel, it was important to flatten the facial convexity of the canine and aggressively remove the canine fossa. This was necessary for the facial of the lateralized canine to reflect light properly and so it would not have the facial prominence of a cuspid. Also, the lateral incisor is normally tucked in against the incisal edge of the lower incisors and the cuspid cingulum would interfere, so we aggressively reshaped the palatal aspect of the canine to have an actual fossa (Fig 23). The orthodontic brackets were then reset to intrude the maxillary first premolars, to place the gingival margins in the appropriate vertical position relative to the lateral and central incisor. The space created by reshaping was closed orthodontically and the patient was sent back to her referring dentist for gingival recontouring and porcelain veneers. The final smile was exceptionally esthetic (Figs 24a & 24b) and the anterior tooth proportions ideal (Fig 25).



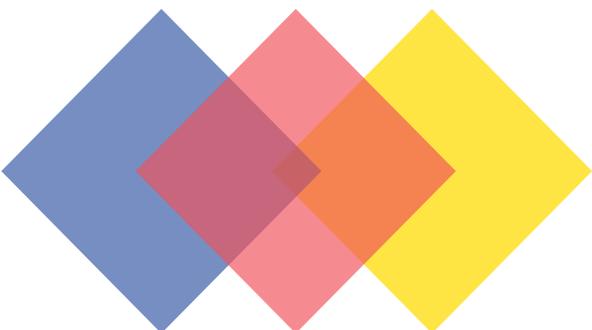
**Figure 20a:** This patient was referred for consultation regarding what could be done to improve her potential smile outcome.



**Figure 20b:** The patient was congenitally missing lateral incisors and had undergone orthodontic treatment during adolescence to substitute the canine for the lateral.



**Figure 21:** This view shows the shortcomings of the canine substitution management (e.g., incorrect tooth proportion and the darker shade of the canines). Rather than reshaping the canines to resemble laterals, the orthodontist had placed the canines in the lateral position and the dentist had added composite to the incisal edge to camouflage the incisal tip, resulting in an excessively wide "lateral incisor."



### Synchronization Plan

Near the end of the orthodontic treatment, the patient needed to decide whether we should intrude the maxillary first premolars. This was easy, as she had already decided on veneers. Working with the dental office, we coordinated a day for removal of the braces and preparation of the veneers, sequentially. The temporaries were fabricated as a single unit to retain orthodontic tooth movement. It was important that retention be placed quickly as it was likely the intruded maxillary first premolars would erupt rapidly after appliance removal. To achieve this, we ensured that the first premolars (which were becoming canines) were included in the fabrication of a single-unit temporary restoration from canine to canine, consolidated into a six-tooth unit. Once the final veneers were placed, the patient returned for final images and documentation, and placement of a clear retainer. We checked for teeth that were prone to relapse and where retention in the full arch was desirable.

### Take-Home Message

The restorative dentist could have obtained a nice result for this case simply by providing veneers. However, the dentist's willingness to consider a more comprehensive approach was critical in elevating a good result to an impressive one. It also is important to note that if canines are to be reshaped, it should be done deliberately and with a clear vision of what the final outcome should be.



**Figure 22:** This illustration depicts the ideal outline of a lateral incisor superimposed on a canine. This allows the dentist or the orthodontist to visualize where enamelplasty needs to be performed to adequately lateralize the canine. In simpler terms, we suggest, "Just carve away everything that does not look like a lateral."



**Figure 23:** Image reflecting the more aggressive reshaping required to convert a canine to a lateral. The incisal tip was flattened, the mesiodistal width reduced, the facial convexity flattened, and the cingulum of the canine converted to a fossa.



**Figure 24a:** Once tooth movement was complete, the patient was referred back to the dentist for placement of veneers, resulting in an outstanding smile.



**Figure 24b:** The close-up smile image reflects the proportionality of the teeth and great improvement of the patient's smile.



**Figure 25:** The first premolars were intruded, and reshaping the laterals to resemble canines led to ideal gingival margin placement and tooth proportion, enabling the dentist to achieve an excellent restorative result.

## Case 5: Class II Malocclusion ◆

This 62-year-old female patient was referred by her dentist about her Class II malocclusion, reflected in her profile (Fig 26). We recommended correction of the malocclusion through combined orthodontic/surgical treatment with mandibular advancement. She had never been happy with her smile (Figs 27a & 27b) and while orthodontics would achieve straighter teeth, we recommended she finish with porcelain veneers once her malocclusion was corrected. Her dentist had also advised her that there were a number of esthetic options she might consider as an adjunct to her mandibular advancement. As a result, she was willing to discuss more than just the dental concerns, and we suggested she consider overall facial rejuvenation through rhytidectomy (facelift), lip augmentation, and blepharoplasty (rejuvenation of upper and lower eyelids). She wished to pursue all these options, so after the orthodontic and surgical plan was completed with her malocclusion corrected and teeth aligned (Fig 28) she went directly for preparation and delivery of her porcelain veneers. The facial procedures were performed one week later. The final outcome (Figs 29a-29c) was impressive from an esthetic standpoint and the advancement of her mandible and chin greatly increased her airway size, with significant health benefits.

### Synchronization Plan

This case obviously required careful attention between multiple specialties. A consolidated treatment plan was formulated in our office, utilizing digital imaging software to demonstrate choices the patient could make and to provide realistic parameters for the team or indicate those that needed to be adjusted in case any of the specialties had constraints. Orthodontic treatment was designed to carry the patient through mandibular advancement and to place the dentition in a favorable position for esthetic dental finishing. In many cases, as discussed above, esthetic soft tissue procedures can be performed simultaneously with the orthognathic surgery. However, with this case we staged the procedures to be done sequentially. We find it best not to perform rhytidectomy concurrently with orthognathic surgery, so that procedure was delayed until the skeletal components were in place. Veneer preparations were performed first and temporaries were placed. This established final incisor position as well as anterior posterior position and lip support. The facial procedures were then completed and the final veneers were placed a few weeks later.

*Editor's Note: This patient's story can be seen at [www.thesmileinside.com](http://www.thesmileinside.com)*



**Figure 26:** This patient's Class II malocclusion reflected in her profile.



**Figure 27a:** She had always been unhappy with her smile.



**Figure 27b:** Close-up smile image demonstrates the irregularity and crowding of the maxillary teeth.



**Figure 28:** The smile after orthodontics and surgical mandibular advancement and advancement genioplasty. After this, the patient elected to have rhytidectomy, blepharoplasty, and lip augmentation.

### Take-Home Message

This case illustrates the expansion of the term *multidisciplinary* to include our medical colleagues, specifically the facial plastic surgeon. The surgeon working with us on this case has been a member of our team for 20 years and understands the soft tissue reaction to the dental and skeletal changes we effect; he therefore is able to develop the facial design in such a way as to produce these types of results. Another important point is that the patient's referring dentist was well versed in this multidisciplinary approach to treatment, was comfortable discussing it with the patient, and did a nice job of preparing her to hear what we had to say.

### Summary

This article presented five cases ranging from fairly simple to very complex. The goals were to demonstrate the greater vision we all should offer our patients, and to demonstrate how orthodontic diagnosis and treatment planning has incorporated smile design principles into our overall functional and esthetic treatment goals.

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**Figure 29a:** The patient's profile after all the adjunct soft tissue procedures were performed.



**Figure 29b:** Veneers were also placed, providing a spectacular smile to complement the rest of her treatment.



**Figure 29c:** Final close-up smile.



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