A CONSERVATIVE APPROACH TO THE RETREATMENT OF PEG LATERAL INCisors AND EXCESSIVE MAXILLARY SPACING

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INTRODUCTION

In the past, the field of cosmetic dentistry seemed only to focus on the “smile” and “smile design.” Dentists spent an excessive amount of time creating caricatures of teeth based on the belief that all patients wanted that perfect “game show host” or “Miss Universe” smile. However, over time it was discovered that many patients did not want teeth that looked too white and too perfect to be natural. This demonstrated a disparity between what dentists thought patients wanted, and what their patients actually found attractive.

Usually, when educated about the choices and consequences, patients tend to prefer a more conservative approach.

One of the major costs of this outdated philosophy of creating the illusion of perfect teeth was the non-conservative nature of the tooth reduction involved. Clinicians would rationalize aggressive preparation treatment plans by emphasizing the fact that “The patient didn’t want orthodontics,” but the fact is that no one really wants orthodontics. Completing an instant orthodontics case with creative tooth reduction and veneers that are actually three-quarter crowns to full-coverage crowns is not a conservative case. This is not to say that in some cases, this type of procedure is unjustified, but it is important that the patient is aware of the biomechanical risks involved for their teeth and periodontal tissues. Usually, when educated about the choices and consequences, patients tend to prefer a more conservative approach.

As a general rule, when it comes to restoring cosmetic cases, if the patient is under 35 years old, the authors prefer an orthodontic/orthognathic approach that involves minimal restorative and prosthetic intervention.
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ever, if the patient is older than 35 and presents with a mouthful of previous dental work or worn down teeth, a restorative prosthetic approach may be the better option. This approach also includes considerations for orthodontic, periodontal, and orthognathic procedures, as need be.

For example, consider the case of a 68-year-old man who wanted a perfect smile and for whom the usual “work-up” was performed and orthodontics suggested. The patient said that if he did not make it through the two years of orthodontics before he received his new smile, he would be upset. In this case, the patient chose “full-mouth” rehabilitation with all-ceramic restorations, knowing that there was a good chance the restorations would outlast him.

However, the following case demonstrates the manner in which a minimally invasive dentistry philosophy was emphasized in order to effect a dramatic change in the patient’s smile. It represents a conservative, interdisciplinary approach, one that satisfied the esthetic demands and expectations of a young female patient.

**CASE PRESENTATION**

A 22-year-old female presented with concerns about the veneers on her lateral incisors because she felt they were not in harmony with her central incisors (Fig 1). She also believed the esthetics of her teeth were poor. The existing veneer on #10, which had cracked, also was irritating her gingival tissue. Her previous dentist had attempted to repair the veneer with composite, but was unsuccessful. The veneer had been remade a few times, and the patient now was experiencing temperature sensitivity with the tooth.

The maxillary canine to premolar regions in the right and left buccal segments appeared “gummy” to her. Five months earlier, aligners (Invisalign; Santa Clara, CA) had been used to correct the mandibular anterior crowding and spaces between her maxillary teeth. Lingual wires were used to retain the maxillary six anterior teeth (i.e., #6-11) and mandibular teeth (i.e., #22-27). The lower anterior teeth appeared to have relapsed to a degree, and evidence of crowding was observed.

Additionally, the patient did not like the mesial inclination of her central incisors and the small black triangle that appeared as a result of tipping the teeth to close the spaces.
MEDICAL AND DENTAL HISTORY

A comprehensive examination and review of the patient’s medical history showed her to be in good health, with no significant findings.

The patient’s upper and lower lips were full, exhibiting a normal smile line. Lip dynamics were normal on her right side, but low on her left side. This gave the appearance of a canted upper lip when she smiled. Her gingival health was good, with only minimal areas of recession and no pocketing greater than 4 mm when probed. The teeth had light areas of staining and supragingival calculus.

The patient presented with a Class I malocclusion with a Class I skeletal pattern. There was a 2-mm overbite and 2-mm overjet present, and the dental midlines were coincident. The maximum opening was 1.5 inches, and centric relation was equivalent to centric occlusion. Maxillary and mandibular arches were aligned, with spacing distal to the canines. The muscles of mastication were asymptomatic, and the temporomandibular joint function was within normal limits, displaying no joint noises or deviations.

Radiographically, the roots of #8 and #9 were divergent from the orthodontic tipping of the teeth. A consequence of this lack of root proximity was a lower crest of interproximal bone, which contributed to an inadequate papillary soft tissue support and the black triangular space. It was assumed that the patient previously had a diastema and spacing of the maxillary anterior teeth due to the peg laterals.

The patient had had all four wisdom teeth extracted, and composite restorations were present on #2 and #3, #12-15, #18 and #19, and #29-31. A no-preparation porcelain...
veneer also was present on #7, and a minimally prepared thin veneer was present on #10. A wavy wire retainer was attached to the lingual surfaces of ##6-11, and another was attached to ##22-27.

**Diagnosis and Treatment Plan**

After a thorough examination that included digital photographs and radiographs, as well as an evaluation of stone casts, and several discussions between the restorative clinician, orthodontist, and laboratory ceramist, a treatment plan was developed to address the patient’s concerns. The three main components of the treatment plan would incorporate restoration of the lateral incisors, soft tissue esthetics, and arrangement of the teeth.

The two lateral incisors presented with different challenges that required attention (Fig 2). Tooth #7 was low in value (Fig 3), and although it was of a proportional length relative to #8, its shade did not complement #6 and #8. The low value was most likely due to the choice of a very translucent pressed ceramic material to restore the unprepared peg lateral with a “no-preparation” veneer. The literature suggests that when the porcelain is thin, it is important to consider the substrate because color-matching to the underlying structure is required. This is significant because not matching the color could negatively impact the final result.

Tooth #10 was slightly higher in value than #9 and slightly longer than #7 at the cervical margin (Fig 4). It appeared that a high-value resin cement was used to insert the veneer on #7, as there was an increase in opacity observed at the cervical margin. The veneer had been replaced more than once, and in this iteration, the ingot used to make the thin veneer appeared to be too opaque. A fracture on the mesial surface of the veneer on #10 also had been repaired with composite and appeared to have caused the apical recession of the interproximal papillae. The overhanging cervical edge of the veneer extended subgingivally, causing minor irritation of the marginal gingiva.

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Both lateral incisors failed to mimic the incisal translucency of the adjacent central incisors. They appeared flat and resembled the outcome typically expected when creating provisional restorations using a single shaded acrylic resin.

The gingival levels of the canine to second premolar on both sides of the maxillary arch were low due to delayed passive eruption. Although the buccal corridors were fairly well developed, they could be improved by correcting the gingival heights using esthetic surgical crown lengthening. It was anticipated that the gingival height of #10 would approach that of #7 after the defective veneer had been replaced with the provisional composite restoration. Also, any final esthetic gingival recontouring would be done using a diode laser at the veneer preparation appointment.

The arrangement of the teeth needed to be addressed with orthodontic intervention. The mandibular anterior crowding and the spacing distal to the canines also required attention. The excessive mesial inclination of the central incisors created a more distally placed gingival zenith. Lack of root proximation resulted in a tendency for the interproximal papillae to be positioned more apically from the more coronal contact point of the two central incisors, resulting in a tendency for a black triangle to emerge.

Although it could be debated that the incisal embrasure angle between the central incisors was a little obtuse, it must be recognized that these were the natural, unaltered, and undamaged central incisors of a healthy 22-year-old. Diversity in human tooth anatomy is what makes us individual, no matter what the perception.

An orthodontic consultation was arranged to address the spacing and crowding issues. It was decided that this problem would be resolved using fixed edgewise appliances.

Therefore, the first step in the treatment plan was to remove the defective veneer on #10 and mock up a temporary composite resin veneer to allow revival of the gingival tissue. It would then be necessary to correct the gingival levels of the buccal corridors on both sides, using esthetic surgical crown lengthening on ##4-6 and ##11-13. Once these treatments were completed, the previous no-preparation veneer on #7 would be removed, #10 would be minimally prepared for thin, stacked veneers (IPS e.max Ceram, Ivoclar Vivadent; Amherst, NY), and both teeth would be provisionalized (Luxatemp, Zenith Dental; Englewood, NJ). The definitive restorations would be seated using resin cement (Variolink Veneer, Ivoclar Vivadent).

The patient’s follow-up treatment plan included hygiene education and home care for optimal gingival health following treatment. Additionally, braces were suggested.
to correct the inclination of the maxillary central incisors, close spacing, and correct the mandibular anterior crowding.

**CLINICAL PROTOCOL**

**REMOVAL OF THE VENEER ON #10**

The first restorative appointment was dedicated to removing the veneer on tooth #10. The patient first was anesthetized with 1 carpule of prilocaine with no epinephrine (Citanest Plain, Dentsply Int.; York, PA). Using a coarse chamfer diamond (856-016, Axis Dental; Coppell, TX), the veneer was carefully removed, with attention given to not removing any additional tooth structure. The tooth had been slightly prepared before, so the existing preparation was smoothed out, and a gingival retraction cord (Gingibraid #0e, Dux Dental; Oxnard, CA) was placed.

A 3-mm diameter spot on the middle of the facial surface of the tooth was treated with a self-etching, light-cured filled adhesive (AdheSE One, Ivoclar Vivadent) for 30 seconds. After light-curing for 10 seconds, a dentin layer of A2 composite (IPS Empress Direct) was applied to the tooth to build up the dentin layer. The enamel layer was developed using A1 and B1 composite shades, followed by Trans 20 for the incisal edge. The restoration was shaped with carbide finishing burs and polished with disks (Sof-Lex, 3M ESPE; St. Paul, MN). The tissue was allowed to heal for one week to determine how far the marginal gingiva would migrate coronally. This also was done to determine where the height of the gingival crest would terminate.

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![Figure 5: Frontal 1:2 view after #10's veneer was removed and replaced with temporary composite resin veneer, and following crown-lengthening surgery.](image1)

![Figure 6: Right lateral 1:2 view after crown-lengthening surgery.](image2)

![Figure 7: Left lateral 1:2 view after crown-lengthening surgery.](image3)
Esthetic Surgical Crown Lengthening

It was determined that the short clinical crowns on #4-6 and #11-13 were caused by altered passive eruption. As a result, the cemento-enamel junction (CEJ) could not be felt with a periodontal probe in the gingival sulcus. The bone-sounding measurements of the teeth from gingival crest to alveolar crest averaged 3 mm midfacial and 3 mm to 4 mm interproximally. This placed the patient in the normal crest biological width category. Patients fall into this category approximately 85% of the time, and the gingival tissue tends to be stable long term. The initial lengths of #6 and #11 were 8 mm and 8.5 mm, respectively. The adjacent lateral incisors were 9 mm; the goal was to create canines approximately 10 mm long, first premolars approximately 8.5 mm long, and second premolars about 8.0 mm long. This increase in length would be obtained apically through the esthetic crown lengthening.

The goal was to move the bone 2.0 mm to 2.5 mm from the CEJ and place the marginal tissue 3.0 mm from the alveolar bone. To accomplish this, a sulcular incision was made from the distal of the lateral incisor #7 to the mesial of the first molar #3 using a 15-c blade. A full-thickness muco-periosteal flap was reflected, exposing the osseous crest near the CEJ. The facial interdental papillae were not reflected with the flap, as no biological requirement existed for the removal of interproximal bone. The bone was thinned using a 7009 carbide bur and water irrigation.

The bone then was placed approximately 2.0 mm to 2.5 mm apical to the CEJ. The thinned bone was reshaped from line angle to line angle using a Wedelstaedt chisel (Hu-Friedy; Chicago, IL). The marginal bone also was thinned and recontoured using a fine bullet-nose diamond (856-016). After thinning the papillae with the 15-c blade, the tissue was replaced, and each papilla was sutured with Vicryl 5.0 (Ethicon Inc.; Somerville, NJ) using a P-3 needle.

The patient was dismissed with postoperative instructions and a chlorhexidine rinse. Sutures were removed two weeks later, and minor tissue adjustments with a diode laser were carried out six weeks after healing. Postoperatively, the tooth lengths and tissue levels desired were gained to improve the appearance of the buccal corridor (Figs 5-7).

Preparation for Porcelain Veneers on the Lateral Incisors

A preoperative impression of the existing teeth was taken with a clear polyvinyl siloxane (PVS) impression material (Peppermint Snap Clear Bite, Discus Dental; Culver City, CA) in a triple full-arch tray and set aside. The lateral incisor at #7 was not prepared, and the lateral at #10 was minimally prepared with an 856-016 fine bullet-nosed chamfer diamond (Fig 8). This was done only because the tooth had been prepared for the previous veneer. The preparation shades were determined to be ST9, and the final shade was a blend of Chromoscop 030, 040, and 110 (Ivoclar Vivadent), with incisal translucency to mimic that of #8 and #9 (Fig 9).

Maxillary and mandibular full-arch impressions also were taken using a light-body PVS wash material (Precision, Discus Dental) and a medium-body PVS matrix material (Precision) in a full tray. A facebow relation also was taken (Kois...
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Dental-Facial Analyzer, Panadent; Colton, CA), in addition to a stick bite. This was done to relate the horizontal plane and a bite registration of the teeth in maximum intercuspal position. These items then were sent to the ceramist, along with a detailed prescription that included digital photographs, a shade map, and the final shade of Chromascop 110/040/030.

**Provisionalization**

Both lateral incisors were spot etched with a 2-mm spot of phosphoric acid in the center of the tooth. After rinsing and drying the teeth, self-retracting retractors were placed. The clear matrix was filled with temporary material (Luxatemp acrylic shade B1) in the areas of the veneer preparations and placed over the teeth. The bis-acrylic was allowed to set for two minutes before gently removing the matrix in order to ensure that the provisionals shrink-locked onto the teeth. The margins of the provisionals were trimmed using finishing burs and disks (Sof-Lex). The provisionals then were polished with brushes, and a surface unfilled resin (G-Coat Plus, GC America, Inc.; Alsip, IL) was placed to impart a glazed finish (Fig 10).

**Laboratory Fabrication**

In the laboratory, the veneers were fabricated according to a platinum foil technique. The dies first were trimmed to the margin using a long fluted bur. This created a definite finish line without undercuts.

A .001-inch thick platinum foil then was folded around the die to serve as a platinum matrix, one shaped like the preparation. The gold color of the foil represented a gold film that was baked on (Aurofilm 2000, Metalor Dental; North...
Attleboro, MA), making the foil slightly more rigid and easier to peel from the veneers once they were fabricated (Fig 11).

Using this temporary framework, the ceramist then built up and baked the ceramic while maintaining the shape of the preparation (Fig 12). This was essential, particularly given the small amounts of ceramic that were placed and baked at a time in order to avoid distorting the matrix when the porcelain shrank.

Translucent dentins were used to control the amount of light allowed to transmit through the restorations (Fig 13). This is critical when teeth have a lot of reduction, or in the mesial and distal areas where there is not much tooth structure to provide a base for the ceramic canvas to cover.

Once the full-contour baking and shaping of the dentin material was complete, the incisal portion was cut back just enough to allow room for the application of incisal effects and translucencies (Fig 14), after which the veneers were baked and then glazed in the customary manner. Prior to sending to the dentist for try in, the internal aspects of the veneers were etched in the usual way (Fig 15).

Because the platinum foil imparts the restorations with a gray cast, it was not possible to know how they ultimately would look until the foil was peeled from the internal aspect of the veneers. Therefore, if the shade was incorrect, the veneers would need to be remade.

**Final Placement Cementation**

Once the veneers were returned from the laboratory, they were inspected for fit and color on the models. The provisionals were removed (Fig 16), the preparations cleaned
Figure 17: Experimentation with the restorations at try in using different value gels ranging from -2 to +2.

Figure 18: Silane was placed on the intaglio surface of the veneer.

Figure 19: A 35% phosphoric acid etch was applied to the preparations for 15 seconds and rinsed.

Figure 20: A bonding agent was placed on the preparations.

Figure 21: A resin cement was added to the internal surface of the veneers.

Figure 22: The veneers were placed on the teeth, and the excess cement was removed.
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with hydrogen peroxide, and the definitive veneers tried in. The fit was verified, and veneer try-in gels (Variolink) were placed to equilibrate the minor shade variations between the veneers and the natural teeth. It was decided that a resin cement (Variolink Veneer) in shade +2 on tooth #7 and -2 on tooth #10 would be used (Fig 17).

The restorations then were removed from the mouth and their internal aspects treated with 35% phosphoric acid for one minute. After rinsing and drying, the veneers were treated with silane (Monobond Plus, Ivoclar Vivadent) (Fig 18). The preparations also were cleaned using chlorhexidine and rinsed. A 35% phosphoric acid (Total Etch, Ivoclar Vivadent) then was applied to the preparations for 15 seconds and rinsed (Fig 19). A bonding agent (Excite, Ivoclar Vivadent) was applied to the teeth for 20 seconds (Fig 20), and the solvent was allowed to evaporate for 10 seconds before being light-cured with a light-emitting diode (LED) curing light (Bluephase, Ivoclar Vivadent) for five seconds.

The resin cement was placed into the veneers (Fig 21), and the veneers were placed onto the teeth (Fig 22), with care taken to spot-tack the center of each veneer with a 2-mm tacking tip (Fig 23). By using a Butler gum stimulator (Sunstar; Chicago, IL) and micro brushes, almost all excess cement was removed. The veneers were flossed interproximally, and glycerin (Liquid Strip, Ivoclar Vivadent) was placed around the margins to ensure curing of the oxygen inhibition layer (Fig 24). The restorations were cured for 30 seconds on buccal and lingual surfaces using the Bluephase LED curing light, and the margins were polished using a #12 scalpel blade, an extra-fine football diamond, and 32...
bladed finishing carbides (Fig 25). Once the polishing was complete, the occlusion was checked, and any areas that required adjustment were polished with a porcelain polishing kit (Ceraglaze, Axis Dental) (Figs 26-28).

ORTHODONTIC PHASE

After the restorations were completed, the patient was referred to the orthodontist for full braces to correct the mandibular anterior crowding and maxillary central incisor inclination and spacing (Fig 29). The orthodontics are necessary to finish this conservative case and improve the overall outcome and esthetics. The decision to perform the orthodontic therapy after placing the veneers, rather than before, was based on consultations and discussions with the patient and the referring orthodontist.

Finally, the patient was instructed to practice smiling in front of the mirror to help rehabilitate the uneven muscle pull and correct the soft tissue asymmetry of the upper vermilion border.

CONCLUSION

The case presented here is just one example of a conservative approach to dental care that produced the desired results. It clearly demonstrates the manner in which we, as esthetic dentists, can employ a combination of conservative restorations to satisfy the patient’s expectations, rather than emphasizing that “perfect smile.” In particular,
by embracing an interdisciplinary approach and solid treatment planning, successful results were accomplished in the spirit of responsible esthetics (Fig 30).

References

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